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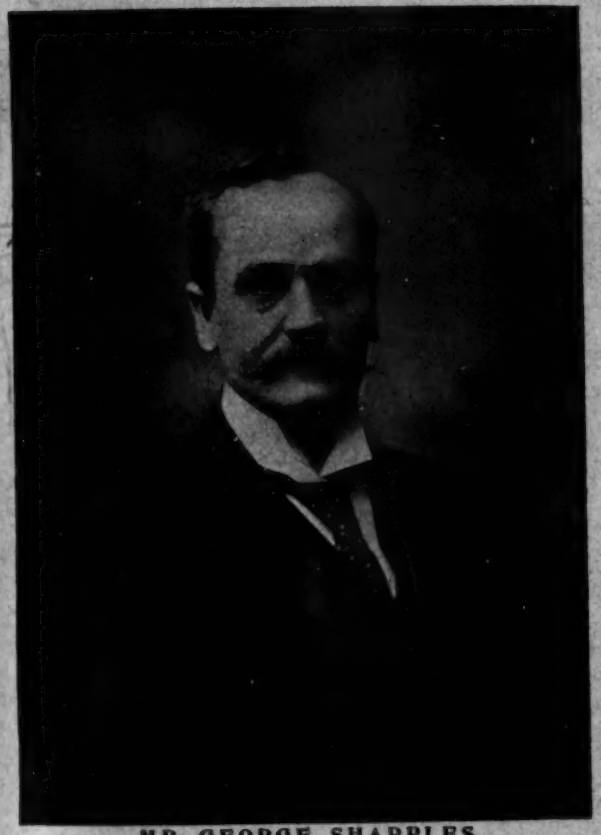

MR. GEORGE SHARPLES,
President-elect, N.U.T.

CONTENTS
OF THE
MARCH NUMBER.

EDUCATION IN PARLIAMENT—BEGINNING OF THE SESSION 427
N.U.T. NOTES 428
NOTES FROM THE NORTH 430
THE COMING CONFERENCE OF THE N.U.T. AT PORTSMOUTH—
THE PRESIDENT-ELECT 432
THE CANDIDATES FOR THE VICE-PRESIDENCY 434
SCHOOL TRAINING. Some Defects and some Remedies .. 437
EDUCATION IN RUSSIA 439
MR. EDGAR D. FEAR 440
A HISTORICAL PRESS 440
CHILD STUDY AND THE TRAINING OF THE TEACHER. By J. Gunn, M.A., D.Sc. 441
CONCERNING FATIGUE 444
ADMISSION EXAMINATION FOR PUPIL TEACHERS, 1904 .. 446
NATURE KNOWLEDGE. By James Kenney, M.A., D.Sc. 447
NOTES OF LESSON ON BUDS AND CATKINS 449
OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK 451
THE INSPECTOR'S NOTEBOOK 453
PRACTICAL HELP IN THE ARITHMETIC LESSON. By George Collar, B.A., B.Sc. 454
A COMPLETE SCHOOL COURSE OF ELEMENTARY GEOMETRY 456
NATURE NOTES FOR THE MONTH. By P. Hobb 458
OUR MODEL INFANTS' SCHOOLS. 461
SCHOOL GARDENING FOR LITTLE CHILDREN. By Lucy R. Latter 464
DIFFICULTIES OF FRENCH IDIOMS AND CONSTRUCTIONS 466
ON FRENCH VERSIFICATION 466
FRENCH PRIZE COMPETITION 467
UNIVERSITY OF LONDON. French Matriculation Examination 468
OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE. By A. T. Flux 469
OUR CERTIFICATE COURSE 473
PHYSIOGRAPHY 476
CHEMISTRY 477
THEORETICAL MECHANICS 478
OUR QUERY COLUMN 479
THE EDITOR'S TABLE 481

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THE

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EDUCATION IN PARLIAMENT—BEGINNING OF THE SESSION.

"THIS will be an Irish session," a member of Parliament said in the lobby, while just within the brass-bound doors Mr. John Redmond was thundering the sempiternal demand for Home Rule.

"Every session is an Irish session," said the member he addressed.

"It will be an education session again," said a third legislator; "every session's an education session now."

All three were right. Ireland will loom large this session, but the chief demand the Irish will make is for a kind of Education Bill—a Bill to set up a Roman Catholic University in Ireland. And, moreover, there is to be a real Education Bill—an Education Bill for Scotland. For the King's Speech from the throne contained these words—the capital letters occur in the stately print of the allocution: "A Bill to amend the Laws relating to Education in Scotland has been prepared for your consideration."

When the debates on the "Humble Address to the Sovereign," in reply to "His Majesty's most gracious Speech," began in the two Houses, precious little reference to Scottish education was made in the House of Lords. The Bishops are not particularly interested in the schools of Scotland, which is either good or bad for the schools according to private opinion on the matter. But a Scot is the leader of the Opposition in the House of Commons, and Sir Henry Campbell-Bannerman in many ways shows that his anglicisation, and even his cosmopolitanism, leave him none the less an ardent nationalist Scot. In his speech upon the Address to the Crown he said: "I turn from the licensing question to a more sentimental question to me—that of Scottish education. I trust that whatever is done will be done in harmony with Scottish traditions and with popular control."

There are no reliable rumours as to the nature of the Scottish Education Bill, but Mr. Graham Murray is to introduce it, and to Mr. Graham Murray his compatriot opposite paid a compliment which was also an expression of trust. Sir Henry Campbell-Bannerman said that he could not believe that Mr. Graham Murray would introduce a Bill not in consonance with the traditional views of Scotland on the matter. No doubt Mr. Graham Murray is one of the ablest and most popular members of the House of Commons, and if he has anything like a free hand he will produce a good Bill.

The point in doubt about the Bill and its principles appears to be whether or not it will follow the precedent of the English Act of 1902. Two years after the English Act of 1870 the Scottish Act repeated much of the contents of its immediate predecessor; two years after the English Act of 1902 a Scottish Act and history may repeat themselves. Are the Scottish School Boards to vanish as the English School Boards have vanished or are vanishing? Or is Scotland still to have for education a local authority *ad hoc?*

A Scottish Bill on the lines of the English Act would mean the placing on the rates of the voluntary schools in Scotland. If this question has caused such opposition from English Nonconformists in the House of Commons, and from nearly all the local authorities in Wales, how will it be received in Scotland? *A fortiori*, the prospect would seem to be one of bitterer opposition still. Yet the operation of the English Act in England is undoubtedly making for greater efficiency in the hitherto voluntary schools, and, matters of representative government and religious differences apart, is proving, on the whole, a boon.

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Among the private members who formed the lucky first ten in the ballot for places to put forward Private Members' Bills,

no one was found who had an Education Bill in his pocket, or would consent to put one there. The chance that a new "Half-Time" Bill could be introduced thus proved futile, and there seems no hope that this session the age for half-time labour can be fixed at a minimum of thirteen.

Up to the moment of the delivery of the King's Speech, something like a general impression prevailed that a Bill to give a new grant from the Exchequer to elementary education in England was to form part of the Government's programme. It was said that this money was to be found in order to destroy the ground on which the "passive resisters" take their stand, since, if there was no further need for school rates to be paid, there could be no passive resistance to paying them. It was also rumoured that Wales, where the Education Act friction is most severe, was to be appeased by a Bill to set up a Welsh Education Department, and to compel for Wales something like the compromise between the Churches and the County Councils which the Bishop of St. Asaph proposed to his clergy in vain. No doubt there was some ground for these rumours; no doubt the Board of Education had these expedients under consideration; but the state of the Treasury forbade the first device, and the veto of the Premier the second.

The delay in the moving of the Free Trade Amendment to the Address, which was caused by the universally-regretted absence of the Premier, will throw the Education Amendment to the Address too far into the month for an account of it to be given here. But when the opportunity comes round, Mr. Lloyd-George will move the amendment in these terms:—

"But we humbly express our regret that, having regard to the widespread feeling of dissatisfaction amongst Your Majesty's subjects with the Education Acts, 1902 and 1903, there is no intention expressed in Your Majesty's Speech to introduce legislation this session with a view to amending these Acts by conferring upon the representatives of the ratepayers the full control and management of all schools maintained out of public funds, and by the abolition of all sectarian tests in the appointment of either the managers or teaching staff of such schools."

Nothing like an approximate date for the introduction of the Scottish Education Bill can yet be assigned, though Mr. Graham Murray has it all ready for production. Certain Scottish members of the House of Commons appear to favour the district rather than the county as the unit of area for administration. Members of the House have been circularised by the Scottish Class Teachers' Association, whose resolutions on the subject ask for:—

1. A central authority, including a Council of Education sitting in London, and including representative teachers.
2. Direct election of the local authority, not by the cumulative vote.
3. A local area not smaller than the "county district."
4. The local authority to be "one," for all educational purposes.
5. A teachers' register.
6. Appointment and dismissal of teachers to rest with the local authority, subject to the central authority's veto.

Whatever the nature of the Scottish Bill, or however long the debate upon it, one thing seems certain, and that is, that the time devoted to educational matters in the sessions of 1902 and 1903 is hardly likely to find a counterpart in the session of 1904; but it is a pity that no Scottish teacher sits in the House of Commons, to give to the debate that particular knowledge and guidance which only the teacher-member can in such a case afford.

BY MANY HANDS.

"Quot homines, tot sententiæ."

N.U.T. NOTES.

"WITH the compliments of the Liverpool and District Teachers' Association," has been lately issued a valuable little brochure on "The Evil of Large Classes," by Mr. J. Kay, B.A., one of the best-known teachers in Mersey's famous city. In his opening words Mr. Kay alludes to the *fons et origo* of his pamphlet: "There is an increasing consciousness in the public mind, evidenced by the observations of thinking and outspoken parents, by the dicta of prominent educationists, as well as by the press, that the impressions of school life are too easily effaced, and that primary education is still somewhat lacking in depth and distinctness." Our author is compelled to admit that the charge is, partly at all events, true; and his explanation is both prompt and thorough. He will have the support of every reader of the *Practical Teacher* in his contention that the one great obstacle to the efficiency of our national education—and let the term include physical and moral as well as mental training—*consists in the inordinate size of the average class in our primary schools.* He makes the astounding statement that "there are hundreds of classes in the Liverpool Council Schools to-day with over 60 children in average attendance, scores with over 70, dozens with over 80, and not a few with over 90;" and probably investigations in other large cities would reveal a similar state of affairs. When it is borne in mind—I quote from the admirable Handbook of the National Federation of Assistant Teachers—that the maximum number of children under the charge of one teacher is, in Denmark 30, Holland 40, America 30, New Zealand 32, France and Switzerland 30, it will be seen how heavily handicapped is the child in the English schools. Few thoughtful educationists will be found to disagree with the following weighty words: "The man or woman best qualified by gifts of mind and temper to influence the rising generation, whose individuality it is most desirable to bring into contact with young and impressionable minds, is not, under present conditions, necessarily the person who is best fitted to survive in the primary school. The man or woman of high character and attainments, but lacking the strenuousness necessary for the ordinary wear and tear of elementary school life, is not a success there, as

Large Classes.

BRITISH MUSEUM

success is estimated nowadays. *The teacher must be a disciplinarian, which means that, however large the class, however great the pressure, however adverse the conditions, an appearance of order and sedateness, always unnatural with children, must invariably be maintained, entailing a rough-and-ready administration which, through its haste, is not always just, and is always repugnant to the teacher.*"

* * *

"CHARACTER," says Mr. Kay, "is not formed, ideals not inspired, by the general manipulation of a multitude. *The very essence of it is in individual contact.* The earnest and powerful preacher may earn the admiration of his flock, but respect and love are awakened by his personal visitations." Considerations of space unfortunately preclude my giving more than the following suggestions of a basis for improvement. Mr. Kay does not claim for them any "pretension to novelty." Nevertheless they are exceedingly useful, and would, if universally adopted, go far to remove the stigma of inefficiency from our primary school system.

Mr. Kay's Suggestions.

1. I would advocate the creation of a Standing Committee of the Education Authority to take over and deal with the question of staffing.

2. No pupil teacher must count on the available staff of a school. We hope our Education Authority will steadfastly refuse to countenance the inflation of school staffs by unqualified apprentices. The pupil teacher must have his normal training in the schools, and it must be thorough and practical; but no pupil teacher should have the continued responsibility of a class. We have all been in this chrysalis state, and most of us feel inclined to pity the raw material on whom our prentice hands were tried. Glancing thus retrospectively over our own history, we can with more confidence affirm of the pupil teacher that his character is unformed, and he often lacks a proper sense of responsibility. His methods of teaching are crude, and his results sometimes startling.

3. To combine standards or forms with different curricula under one teacher is uneducational. Only in the case of very small classes should it be permitted, and in no case should it be necessary to combine three standards.

4. Standard VII., as heretofore, and, if possible, Standard VI. also, in view of the critical age of the children, should have preferential treatment.

5. It would greatly help towards the equalisation of numbers in classes if schools were at liberty to discard the old standard system, in favour of an increased number of forms with more graduated curricula. The number of forms might increase with the size of the school. Such a reform will only be possible when Labour Examinations, School Inspections, and much other educational machinery, cease to be based on the standard system. Needless to say, such a reform should be accompanied by the freest liberty of classification.

* * *

CLOSELY bound up with this question of "large classes" is that of "barrack schools"—*not* of course the huge institutions erected for poor-law children under the Local Government Board, but the Gargantuan establishments wherein accommodation is provided for over 1,000 children, under a single head teacher. Four years ago the N.U.T. Executive (at my suggestion) adopted a resolution expressing their opinion that "on purely educational grounds no department of a school should, in the future, be erected with, or enlarged to, a capacity exceeding 300 children." This resolution was then sent to the local associations for approval, and no less than 98 per cent. of the members recording their opinions expressed their agreement with it. On the eve of the Bristol Conference the Board of Education made the important pronouncement that "a department for elder children should be limited to 300, and for infants to 400." An impression is abroad that the Board of Education has not striven very successfully to carry out its own building rules, and at the recent Conference of the Head Teachers' Federation Miss Cleghorn moved, "That this Conference views with regret the sanctioning by the Board of Education of the erection of a large number of 'barrack schools,' and urges the Board to carry out its own regulations as to the size of the schools." To my amazement, the motion was lost, the votes cast being—*For*, 2,484, *Against*, 2,488. So far as one can gather from the necessarily condensed report, the advocates of the mammoth schools relied on "almost perfection in classification" as their main argument. Pushed to its logical conclusion—if all the children in a town were taught under one roof, the classification would be *perfect*. "Which is absurd," as the mathematicians are wont to say. Mr. E. S. Mortimer of London seemed to make a "hit" when he said that this almost perfect "system of classification was intended to take away from the dull children all brightness. (Laughter.) He would have them stagnate in dullness. (Renewed laughter.)" With me, this is not a question of "strong" head teachers and "weak" head teachers. A "strong" head teacher would exercise more than twice the amount of good in a school of 300 than in one of 600, as every educationist knows.

Large Schools.

* * *

I HAVE had the good fortune to visit many of the leading training colleges of this country, and was possibly more forcibly impressed with Homerton than any other. I saw it at its best, on a bright June afternoon, a few weeks before the demise of the late energetic principal, Mr. J. C. Horobin. Visitors to Cambridge need no reminding of its delightful situation, whilst its general equipment is of the highest character. Its board of management have made a spirited attempt to meet the inadequate accommodation in training colleges for women teachers by spending £8,000 on a new wing for students, and £1,000 for servants' quarters. The total number of students now provided for amounts to nearly two hundred, thus making Homerton the largest college in the country. From the report issued by its board of management, I gather that the cost of maintenance works out to £63 per head, of which sum the students themselves provide £28. The college is absolutely unsectarian, and its work dates from the foundation of the King's Head Society in 1695. This society was established for the purpose of aiding weak Congregational churches, and seems from the first to have taken an interest in not only the preaching but the teaching work of such churches. The old Homerton College, founded in 1769 and rebuilt in 1822, trained both ministers and teachers. After a time, however, the work of training teachers was discontinued, theological students only being received. In 1850, when the training of teachers was resumed,

Homerton College, Cambridge.

both men and women were admitted. Dr. W. J. Unwin, Mr. E. Liddell, and Mr. J. C. Horobin were respectively principals of the old college. In 1894, Cavendish College was purchased, and is now an exclusively women's institution, under the educational direction of Miss Allan, L.L.A. (late Lecturer of City of London Training College). Mrs. Horobin remains at Homerton in the all-important position of bursar.

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The Dearth of Pupil Teachers.

AT the annual distribution of prizes to the successful students of the Barrow Higher Grade School, whose principal is my good friend Mr. James Harris of the N.U.T. Executive, Alderman Barrow, Chairman of the Education Committee for the borough, alluded to the supply of teachers. It appears that Barrow-in-Furness requires annually from 25 to 30 P.T.'s, and these are not always forthcoming. The worthy alderman utilised the chance he had of addressing the parents by reminding them that, in choosing a vocation for their children, they could "with advantage make them teachers, and by so doing they would be rendering services not only to the town of Barrow, but to the country at large." This advice was received with "applause." Yet the parents of promising boys (especially) would do wisely to consider the ultimate prospects of the profession before concluding that an El Dorado awaited every youthful Orbilius.

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The Teachers' Provident Society.

AMONGST the ancillary institutions connected with the N.U.T., none is more eminently helpful and generally beneficial than the Teachers' Provident Society, or the "T.P.S.," to give the term affectionately used by its ardent admirers. Ten years ago its members numbered but 1,602, five years later the total had grown to 4,807, and to-day the aggregate membership is well over 10,000. Its board of management is composed of keen and alert men, with business aptitude and habits; and these have been reinforced, during the past three or four years, by Miss Jobson of Chelsea, the only lady (if my memory serves me correctly) who has acted in this capacity. Ever favoured in the *personnel* of its board, the society has been still more fortunate in its secretary, Mr. A. Golding, an active, clear-headed, strenuous gentleman, whose sole object in life is the prosperity of the society and its members. Mainly, I imagine, through his efforts, the board has decided to issue, every three months, a little brochure, in order (1) to afford the latest information and statistics which may prove helpful in canvassing for new members, (2) to give hints and suggestions as to the best means to be pursued in carrying on the detail work of the society, and (3) to afford an opportunity for free discussion of any point of interest in connection with the benefits or work of the society. The first issue is well arranged and brightly written, and the local secretaries, to whom the society owes so much, will doubtless appreciate this happy new departure.

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Education in France.

THE interchange of visits between French and English teachers is not only doing its fair share in developing and deepening the *entente cordiale*, but usually results in the collection of information as valuable as it is interesting. A particularly full report was submitted to the Executive after the recent visit of Messrs. Crook and Jackman to Paris, and I regret that considerations of space only allow me to quote the following typical paragraph: "The Government Inspectors in their visits, which are without notice, see the exercise books which have been in use during the term, and ask questions on the work of the term or on the lesson in progress. *No individual examination of any kind is held, nor is any examination on paper taken.* The assistant teachers examine their classes in at least four subjects monthly. The individual record of each child is kept in the attendance register." It is a little disquieting to learn that "secret reports are made monthly by the head teachers," although their importance is minimised by the knowledge that in every case where complaint is made the teacher concerned is informed, and an inquiry held by the inspector.

A. C.

NOTES FROM THE NORTH.

Scotland's New Education Bill.

"A BILL to amend the Laws relating to Education in Scotland has been prepared for your consideration." Such are the terms of the King's Speech with regard to the proposed Education Bill, and formal notice of his intention to introduce the Bill at an early date was given by the Secretary for Scotland. I have it on very good authority that the Government have resolved to abide by the *ad hoc* principle, and that they have agreed at the same time to extend the educational areas. In all probability the County District will be the new area. Any fight that is likely to take place will be round the question of management. In some quarters there is a distinct idea of delegating this work to the Parish Councils. On the other hand, teachers view this proposal with much disfavour; and as the result of their efforts, it is more than probable that the solution of this difficulty will be found in the appointment of a Committee embracing representatives of the parish and of the district Board.

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Co-ordination.

IT will also be found that ample provision has been made for the co-ordination of elementary, secondary, and technical education, and the "pooling" of all moneys allocated to education. The sporadic efforts of County and Town Councils in technical education will be superseded, and the gain to education will be immense. Rate-aid will not be given to denominational schools, and consequently little or nothing will be heard of the religious difficulty. The only danger to be feared is dissolution. If the Government cross the first ditch—namely, the Debate on the Address—the Bill will be before the country; but the more difficult ditch to be crossed no doubt will be the Budget. These two successfully negotiated, Scotland will have, what it so much desiderates, the beginning of a new era in her system of national education.

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Superannuation.

AT first it was thought that the introduction of the Bill might form a fitting opportunity for the improvement, or rather for a new measure, of superannuation. It is now, however, believed that the best plan will be to try to get some improvements made on the Act of 1898, especially with regard to the existing teachers. How these improvements may be effected the Institute has pretty well made up its mind, but whether its wishes

will prevail is another matter. There are, however, some hopes that the Institute will carry its policy; but I am not at present permitted to give any further information on the subject. The introduction of new points will perhaps be reserved till the quinquennial period for revision arrives—namely, 1905. One thing has been proved to the satisfaction of members of Parliament, and that is, that the present Act is not a success. It would have been most interesting if we could have had a return of the actual number of teachers who had been in the profession twenty years and upwards prior to 1898, and who did not accept the Act. This formidable list would have convinced the average member of Parliament that the present allowance was totally inadequate.

ONE of the most pressing professional problems at the present time is the supply of trained teachers. From all parts of the country come reports of the great difficulty being experienced by School Boards in filling up vacancies. There can be little doubt that the scarcity is increasing with alarming proportion, and in some quarters it is even being said that schools will have to be closed because of the lack of teaching staff. While these reports may be exaggerated, yet it is evident to any intelligent observer that the supply is totally inadequate to the demand. Even untrained teachers cannot now be had except at a premium, and it was only the other day that I received the information that an ex.-P.T. had been appointed at a salary of £100. More or less adventitious means are being resorted to to supply the deficiency, but the shortage will not be remedied unless School Boards and educationists tackle the question fairly and squarely.

Scarcity of Teachers.

SEVERAL of the factors which have contributed to the present state of matters are non-permanent. The difficulties of the situation have been increased by the emigration of many teachers to the South African colonies. Another cause is the fact that the Education Department cut down the number of pupils to each certificated teacher from 70 to 60; and even more by the introduction of the supplementary courses, in which the number of pupils a teacher may have charge of is 40. Last year, again, the increase in average attendance was 10,130, and as that increase was largely among the senior pupils, it will be seen that this increase absorbed fully 250 new teachers. The total number of teachers added to the profession last year, trained and untrained, was 357. It would naturally be expected, in view of these facts, that the Education Department would do something to increase the supply, but as yet they have made no movement in this direction.

Causes of the Shortage.

THE greatest factors in this serious difficulty are the small output from the training colleges and the want of a bright outlook for the profession. The training college accommodation is totally inadequate. The average number of fourth-year pupil teachers during the last few years has been 960, yet the number of places in the training colleges is about 650. By an increase in training facilities the quality of the teaching staff would be raised: I do not think the quantity would be affected. The result, however, to the education of the country would be a distinct gain. The increase of training-college accommodation would be only a temporary and partial remedy. The most effective remedy would be an improvement in prospects. When it is considered that out of the 4,366 male teachers in Scotland only 68 received a salary of £400 or over, while no fewer than 3,621 received less that £200, it is little wonder that so many are fighting shy of the profession. It is very much a matter of brighter prospects, and this the School Boards have in their own hands. I question if the matter will be righted until education becomes more of an imperial concern and less of a parochial matter. So long as teachers' salaries are paid out of rates, there will be a tendency, in keeping these down, to starve the salaries. When one meets with a rate of 10s. in the pound, as was my experience on a recent occasion at a place where I was addressing teachers, there is little hope of much progress.

Permanent Causes.

BY the death of Mr. Peter M'Intyre, F.E.I.S., Kerrera, one of the original founders of the Institute has been removed. Many of us who travelled to Inverness Congress had hoped to see him there. His portrait appeared in the Congress Book. He was appointed schoolmaster of the island of Kerrera, near Oban, in 1846, in succession to his father, who had taught the Kerrera school for thirty-five years. Mr. M'Intyre joined the Institute in the year of its birth, and for exactly fifty years he acted as treasurer of the Lorn branch. He celebrated his jubilee in 1896, and at a large public gathering in Oban was made the recipient of a plaid and brooch and a purse of sovereigns from old pupils and fellow-teachers. He retired from active service a year or two ago, after having taught for nearly sixty years. The Lorn branch will sadly miss his presence.

The "Father of the Institute."

AT present the Institute is, through its newly-appointed Organising Secretary, doing much to impress on members of Parliament its views with regard to superannuation. Hopes are expressed that its timely influence in this matter will effect some improvement in the present scheme. With regard to domestic matters, the various branches are at present making nominations for the offices of President and Vice-President. Up to the present three candidates have been nominated for the higher office—namely, Mr. John Forbes, Springfield, Fife; Mr. J. M'Kenzie, Ashley Road School, Aberdeen; and Mr. James Young, High School, Biggar. A contest will thus be necessary. For the office of Vice-President, up to the time of writing there have been two candidates nominated—Mr. J. S. Will, New Pitsligo, and Mr. Robert Dickson. Edinburgh. In future notes I hope to give a brief sketch of the various candidates.

R. G.

E.I.S.

THE Delegates of the Clarendon Press are making arrangements for a thorough revision of Liddell and Scott's Greek-English Lexicon, quarto edition. They have obtained a promise from Mr. Arthur Sidgwick to undertake the active duties of editorship as soon as he is free from certain other literary engagements, and the collection of materials has been begun. Several scholars have sent, and some have promised to send, the corrections or additions which they have accumulated, and it is hoped that any other scholars who are willing to give similar help will communicate with the Secretary to the Delegates, Clarendon Press, Oxford.

THE COMING CONFERENCE OF THE N.U.T. AT PORTSMOUTH.

THE PRESIDENT-ELECT,

MR. GEORGE SHARPLES.

THE chief officer of a Union now well over 50,000 strong must necessarily be a many-sided man. He must be sufficiently hardy physically to undertake long and tiring railway journeys to the very extremities of the country, in order to take part in educational demonstrations; he must be robust enough to withstand the strain of lengthy and occasionally weary Executive meetings; he must be ready at every moment to state the position of the Union on any educational or professional question; he must be cognisant of the domestic work of the N.U.T., down to its minutest detail; he must be ready to bear his part bravely and worthily in connection with the multitudinous social functions organised by the local Associations; he must be prepared, during his year of office, to indite replies to thousands of correspondents (the vast majority of whom he does not and cannot know) requiring information and advice on every conceivable subject.

MR. GEORGE SHARPLES.

And during Conference week what a truly colossal task is his! From the eve of Good Friday until the end of Easter week he is literally the cynosure of every eye. His presidential address, sent in advance to every journal of repute in the United Kingdom, must not only palpitate with interest, but be up-to-date, pungent, critical, exhaustive, and a statesmanlike pronouncement on the urgent educational questions of the hour. In the chair of the Conference he must be ever on the *qui vive*, prompt to decide on delicate and ticklish "points of order" — those eternal nuisances!—tolerant yet not too indulgent to the bores, and ready at any second to deal kindly with the eager seeker after truth. Above all, he must be scrupulously fair, the guardian of the rights of minorities, impressive and dignified from start to finish, and gentle to a fault towards each one of the two thousand delegates. He must appear, if only for the briefest space, at every function of the week, and make short, pithy speeches wherever he goes. Twenty-five or thirty addresses is the minimum which falls to his lot. Finally, he must have the good fortune and felicity to be supported by a helpmate whose presence will lend grace at every turn, and who will be responsible for many charming little acts during the course of Conference week.

The roll of former Presidents of the Union is fast becoming lengthy. It contains the names of many distinguished and honourable men, some of them possessing more than a national reputation. A more fitting successor to even the most illustrious of these than Mr. George Sharples, the Manchester gentleman who will be inducted into the chair on the morning of Easter Monday, 'twere impossible to conceive or even desire, and the Union can congratulate itself with complete complacency on its splendid choice of a year ago.

In his profession Mr. Sharples is quite at the top of the tree, and since leaving Battersea College in 1876 he has held the following important professional appointments:—1. Headmaster All Saints' Church Schools, Bolton, 1876–9; 2. Headmaster Pikes Lane Board School, Bolton, 1879–81; 3. Inspector of Bolton Board Schools, 1881–3; 4. Headmaster Spring Grove Central Schools, Huddersfield, 1883–8; 5. Headmaster Leeds Central Higher Grade School, 1888–9; 6. Headmaster Waterloo Road Board School, Manchester, 1889 to present time. This list includes the names of some of the finest and best-known schools in the country, and a record of the achievements of Mr. Sharples' "old boys" is as illuminating as it is attractive. His varied experience in schools of such vastly different types as those enumerated above has often stood his fellow-teachers in good stead; and his almost unequalled knowledge of school affairs and prompt judgment were speedily recognised at Russell Square. After acting as Vice-Chairman for one year, he was chosen as Chairman of the Technical and Secondary Education and Evening Schools Committee of the Executive, and in this capacity served with distinction for three years. At the close of the third year the work of this committee was merged in that of the General Education Committee of the Executive, and Mr. Sharples was unanimously elected chairman. Every one felt that the mantle of the veteran educationist Robert Wild could have fallen on no more worthy and capable shoulders, and Chairman of the Education Committee Mr. Sharples remained until he became Vice-President of the Union. Then, following a custom which prevails at Russell Square —although, needless to say, there is no *rule* dealing with the matter—he relinquished his arduous post, which fell, naturally and almost providentially, to another talented Lancashire gentleman, Mr. A. R. Pickles, B.A.

Merely to enumerate the more important positions that Mr. Sharples has occupied during the past eight-and-twenty years requires no inconsiderable space. As one would expect, he became a member of the N.U.T. at the earliest possible moment, and for six years was

a member of the Bolton local Association—one of the most active and vigorous, by the way, that the writer of this sketch is acquainted with. Then for a further period of six years he was associated with the Huddersfield teachers, becoming President of their Association in 1887–8. Like many more of his fellow-teachers, Mr. Sharples was a Churchman labouring in a Board school; yet his active sympathies were ever with the teachers working under unfavourable conditions, and for two years he was a member of the Council of the Huddersfield Church Day Schools' Association. Whilst at Huddersfield he acted as Treasurer of the West Yorkshire District Union, which even at that comparatively remote period (1885–7) was something of a power in the land. His one year at Leeds saw him, naturally enough, a member of the Committee of the Leeds Association.

In September 1889 Mr. Sharples received the appointment of Headmaster of the Waterloo Road Higher Grade Board School, Manchester, and for nearly fifteen years the members of the profession in and around Cottonopolis have benefited by and appreciated his magnificent labours. In the early "nineties" the ruling power of the Manchester Association was a group of very fine, influential, and capable men verging on middle age. It is possible that the strenuous and vigorous methods of Mr. Sharples caused some little fluttering in the dovecotes; but his worth was speedily recognised, and in 1894 he became President of the Manchester Association. The following year he served as Vice-Chairman of the Manchester Conference Committee—Mr. James Scotson, M.Sc., that "prince of schoolmasters" (as some high educational authority quite accurately described him), was the chairman—and in addition he acted as Secretary of the Manchester and Salford "Conference" Benevolent and Orphan Effort. Though memories are short, it is not yet forgotten that the Manchester and Salford Purse realised £4,600, an amount which has never been approached, much less exceeded, but which nevertheless remains an object worthy of emulation by the most ambitious and progressive local Association. The total raised for the Manchester Conference Purse was £14,600, a prodigious sum in those days; for it must be remembered that the organisation of the B. and O. Fund was then in nothing like the efficient state of to-day. In fact, practically everything depended on the resource and energy of the Conference town, and Mr. Sharples and his colleagues must still hear on similar occasions the resounding and acclaiming cheers which the announcement of their own and the country's efforts evoked.

If he were asked what branch of Union activity appealed to him the most, probably Mr. Sharples would reply, "The work of the Benevolent and Orphan Fund." Whether this surmise be correct or not, all his life he has devoted much precious time to his beloved work of assisting the afflicted and relieving the suffering and distressed. Not long after settling down in Manchester he founded the Manchester and Salford Schools Athletic Association, and for eight years he wielded the secretarial pen. Compelled by increasing public duties to relinquish this post, he became the Association's vice-president. He has to-day the ineffable satisfaction of knowing that over £1,100 have been forwarded to the B. and O. Fund as the result of his own "happy thought." He has been the Vice-Chairman of the Manchester Teachers' Local Benevolent Board since 1897, is a life governor of the Church Teachers' Benevolent Fund, and a vice-patron of the Union's B. and O. Fund. For the past eight years he has been a member of the Central Council of the last-named fund, and has made his presence felt on many occasions. With a holy horror and magnificent scorn of anything approaching niggardliness where real want is proved, Mr. Sharples is ready to spend every penny of the fund, if necessary, and then appeal for more; and he is right.

Like men in a higher, although not necessarily more useful sphere, Mr. Sharples has a "programme." If he is able to see half of the following effected before he retires from public life, he will not have done badly:—

1. A national system of education, under which every school (large or small) shall receive adequate financial support.
2. The placing of primary, secondary, and technical education under one and the same local authority.
3. Teaching a profession, with a code of professional honour.
4. Reasonable security of tenure, with power of appeal against unjust dismissal.
5. One column for all teachers on the register, and an open inspectorate.
6. Improvement of Teachers Superannuation Act.
7. The same rate of salaries for infants' mistresses as for girls' mistresses.
8. Equal grants for infants' schools as for those of boys' and girls' schools.
9. Improvement in status and pay of the fully qualified class teacher.
10. Smaller classes.
11. An effective Sustentation Fund, to enable the Union to grapple with starvation salaries and unjust and capricious dismissals.
12. The abolition of unqualified teaching power in schools.
13. One entrance to the profession—the teachers' diploma.
14. The right of C.P. to all certificated teachers.
15. The complete civil and religious liberty of the teacher outside school.
16. "Equality of opportunity" of education to every child.

For the past seven years Mr. Sharples has been a leading member of the Executive of the Union. Reference has already been made to his work on the Education Committee; yet it must be added that his success as its chairman caused the Executive to elect him unanimously to represent the Union on the Teachers' Registration Council. His task on that council has been full of difficulties. No official secrets are betrayed by the statement that from the outset he was met by a dead wall of prejudice against the Union's position regarding the register. So skilful, however, is he, so fearless, and at the same time so full of tact, that those who know him are confident he will make his fellow-members ultimately realise the righteousness and justice of his demands. As a member of the Tenure Committee for six years Mr. Sharples has done invaluable work, frequently receiving the thanks of the Executive and the lasting gratitude of those he has sought to help.

In his younger days Mr. Sharples was a magnificent athlete, for some years captaining the famous Bolton Wanderers Football Club, in the ante-professional era. Even now his expressive face brightens with more than usual delight as he recalls memories of victories bravely won. He has relinquished football, but is still a keen

cyclist and a great walker; whilst to see himself disport himself in the water—the Mediterranean for choice—impels one to attempt, *longo intervallo*, to go and do likewise. Mr. Sharples is one of the best and most effective platform speakers the Union possesses. Of delightful presence, ever cheery countenance, breezy wit, and, at the same time, sincere and earnest conviction, there is no wonder that he succeeds. He is one of the men whose every action *must* be noble. He has probably more personal friends than any other member of the Executive, and he deserves the pleasure and happiness that friendship brings in its train. He is an ideal *camarade*, as ready to be sympathetically silent as boisterously merry. Perhaps he is too sensitive and highly-strung to be a perfect President of the Union; yet if he fails in any respect, he will fail gloriously. His almost boylike pride in the possession of a charming and accomplished wife and two singularly gifted children—both graduates—only causes those whose privilege it is to be intimate with him to love him the more.

THE CANDIDATES FOR THE VICE-PRESIDENCY.

NEXT in dignity and interest to the position of President of the Union comes that of Vice-President, and this by virtue of the admirable rule that "the Vice-President of one year shall be the President for the succeeding year." For twelve months the Vice-President is thus "in training" for the Union's blue ribbon, and he ordinarily toes the mark, on Easter Monday, fit as the proverbial fiddle. Usually it is an easy task to "spot" the next Vice-President. Year by year the "runner up" in the previous contest attains the much-coveted goal; but matters are a little complicated in this year of grace, owing to the only unsuccessful candidate at the 1903 election being no longer in the field. Had Mr. T. H. Jones been an aspirant, the odds would have been more than "Lombard Street to an orange" that he would have been acclaimed Vice-President at Portsmouth. His acceptance of an inspectorship under the London School Board, however, necessitated his entire withdrawal from Union work, and with a practically "open field" there are this year candidates galore. No less than eight gentlemen received nominations; but of these, Messrs. Hole, Pickles, and Shawcross have declined to go to the poll. The reasons for Mr. Hole's withdrawal have been announced to readers of the *Practical Teacher*. Mr. Pickles probably remains in retirement because Lancashire already furnishes one excellent officer to the Union. Mr. Shawcross, keen, alert, and enthusiastic as he undoubtedly is, has wisely decided that his time is "not yet." According to custom, we give brief accounts of the five remaining candidates, three of whom—Messrs. Blackburn, Phillips, and Sykes—enter the lists for the first time. "May the best man win!"

MR. F. C. BLACKBURN,

the headmaster of the Maryland Point Council School, Stratford, E., makes his bow with the whole-hearted support of the members of the West Ham Association, one of the largest and most progressive of the local branches of the N.U.T. Since leaving the Borough Road Training College in 1882, Mr. Blackburn has taken a very prominent and fearless part in every educational and professional question, and his vigorous policy has secured for him the enthusiastic support of head and class teachers in all grades of schools. In earlier days, when the cause of the class teacher was a little less popular than it is now, Mr. Blackburn was one of the pioneers and hardest workers of the West Ham Class Teachers' Association, founded, by-the-bye, away back in 1889. Since that date he has been successively Secretary, Vice-President, and President of the West Ham Association, winning golden opinions in every office he filled. The advent of the electoral districts scheme of electing the N.U.T. Executive gave Mr. Blackburn scope for still more responsible work, and it is significant of his personal popularity that in 1898 and each succeeding year he has been returned head of the poll in the East London District. At the Executive he is not amongst the members afflicted with *cacoëthes loquendi*. Yet, on occasion, he speaks forcibly and with point, and is undoubtedly one of the best debaters at Russell Square. Early in his Executive career he was elected Vice-Chairman of the Rural Schools Committee. His best work, however, is admittedly on the Finance, Press, and General Purposes Committee,

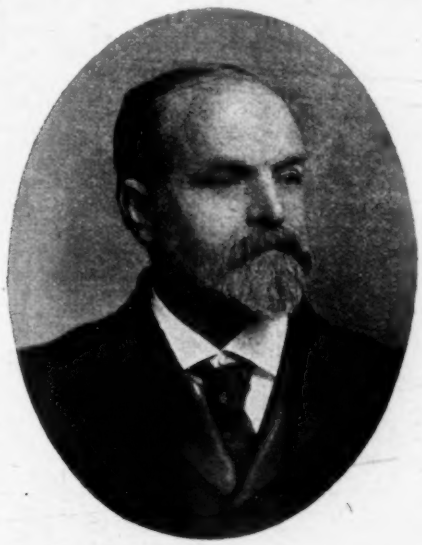
MR. F. C. BLACKBURN.

on which he serves as Vice-Chairman, and also acts as Chairman of the "Rota" Committee. He has received nominations from about twenty local Associations, and of these the most prominent are Bromley, Burton-on-Trent, East London, London (West) Suburban, West Lambeth, West Ham, and Great Yarmouth. That invaluable handmaid of the Union, the Teachers' Provident Society, supplies Mr. Blackburn with at once a hobby and a "serious business" of life. He has been a member of its Board since 1889, and for the past four years has been the chairman of the society. *Quarterly Notes* pays him this handsome tribute: "It is well known on the Board that it is mainly due to the tact, discretion, and courtesy shown by the chairman that the mass of detail work that comes before them at each meeting is so expeditiously got through, and that much of the success of the society is due to the ability with which he presides over those deliberations." Mr. Blackburn's programme shows him to be a thorough and advanced educationist, and whenever the Union

chooses him as its chief Executive officer, it will have a gentleman of grit and determination who thoroughly understands its needs.

MR. TOM JOHN

is possibly the best known of all the "V.-P." candidates, having been a member of the Executive during the past seventeen years, and a frequent aspirant for the

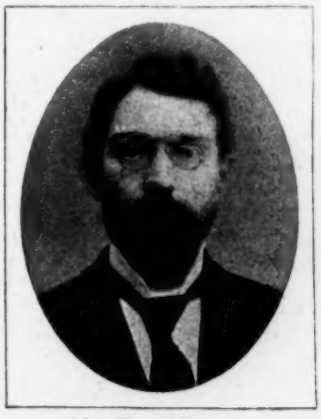


MR. TOM JOHN.

Union's presidential honours. Latterly he had retired from the contest, with noble self-abnegation, in order to enhance the chances of success of his brother Welshman, Mr. T. H. Jones. The withdrawal of Mr. Jones, however, sees him once more in the field; and the fact that he is nominated by 194 Associations speaks eloquently of his prospects of success. Amongst these Associations are Barrow-in-Furness, Bath, Birkenhead, Birmingham, Bolton, Bristol, Cardiff, Carlisle, Exeter, Greenwich, Grimsby, Hull, Leicester, Newport, Norwich, Oxford, Reading, St. Albans, Southampton, North Staffs., and Swansea—a thoroughly representative list. The following particulars concerning Mr. John's work and devotion to the Union are worthy of more than a passing glance:—Thirty-two years a member of the Union; seventeen years a member of the Executive; 1889, Vice-Chairman of the Organisation Committee; 1890–4, Chairman of the Organisation Committee; 1895, 1896, 1898, and 1889, Vice-Chairman of the Parliamentary Committee; 1902, 1903, Chairman of the Law Committee. Certainly none of his opponents can muster so formidable a record. In the chair of the Law Committee he has excelled himself. When he was appointed in 1902 he had to fight hard for this distinction; but so successful in every way was he that last May the Executive gladly and unanimously re-elected him to the post. He is a vice-patron of the "B. and O." Funds; and his sympathy for the widow and orphan was never better evinced than by his raising, almost single-handed, the stupendous sum of £1,700 for the Cardiff Conference purse. Those who are in the best position to judge claim that, owing to many self-denying efforts on his part, Wales has in recent years taken a prominent share in all Union work. They further claim that the steady growth of Unionism in the Principality is mainly due to his untiring efforts. He has been for many years the pioneer of every movement to better the status of the teachers in the Welsh primary schools. His presence on the University Court of Wales and the Central Welsh Board has been of the utmost value to the teachers in the Principality, and it is largely due to his exertions that the primary teacher has received recognition on these educational bodies. His programme runs:—1. A national system of education, with the abolition of denominational religious tests for teachers. 2. Teaching a profession, with a professional code of honour. 3. One register for all qualified teachers, and an open inspectorate. 4. Fuller recognition of the status and responsibility of the class teacher, with (*a*) full powers of discipline, (*b*) smaller classes, (*c*) worthier remuneration. 5. Amendment of the Superannuation Act, so as to secure a lower age of optional retirement and an increased allowance. "The perfervid eloquence, the acute reasoning, and the Keltic imagination of that prince of Welsh orators, Mr. Tom John" (to quote *The Educational News of Scotland*), will be invaluable to the Union when this experienced and enthusiastic gentleman becomes Vice-President.

MR. FRED. PEAKER

some five years ago took a preliminary canter over the "V.-P." course, and polled very creditably indeed, for a first attempt. Since that time he has been content to stand aside and see other gentlemen, bound to him by various degrees of *camaraderie* and close friendship, but possessing no greater claims, become successively Presidents of the Union. This year, at the urgent request of the Leeds Association, he is, for the second time, a candidate, and worthily has he merited the distinction. Since leaving St. John's College, York—now, *par parenthèse*, one of the best-equipped and most up-to-date of all the provincial training colleges—he has been a member of the Union, and a most active member too. Very early in his career he became the Secretary of the powerful Leeds Association, and in that capacity exhibited such energy and ability that he was speedily singled out for Executive honours. He was the youngest member that ever sat round the Executive Board; and to-day, with a record of four-



MR. FRED. PEAKER.

teen years' splendid service to his name, he is happily still on the sunny side of forty. He was the second class-teacher to appear at Russell Square—the first

being that good Unionist, Mr. J. E. le Manquais—and, in an age when the class teacher was much less appreciated than he is to-day, Mr. Peaker made a decided position for himself through his fine grip of the Union's questions and his readiness in debate. Since 1897 he has acted as chairman of one of the most important of the Executive's standing committees—namely, the Finance, Press, and General Purposes Committee—and in that position is admittedly without a rival. In their report to Conference in 1898 the Executive stated: "Mr. Peaker has unsparingly devoted himself to the work, showing himself to be a worthy successor to Mr. Ellery in the chair." Again, in 1899: "Under the able chairmanship of Mr. F. Peaker, the increasing work of this committee has been successfully carried out during the year." And year by year the conviction that he is emphatically "the right man in the right place" but grows and is strengthened. The secret of his success is simple. He spares no pains to make himself *au fait* with the smallest details on the agenda paper of his committee, usually devoting several hours to their consideration before the committee meets. One of the incidents (and penalties) of his official position is his defence of the Union's balance sheet at Conference. This responsibility is sometimes less pleasant than it might be, yet Mr. Peaker's courage never wavers, and an occasionally hostile Conference has been compelled to acknowledge the force and ability with which the Executive's position has been stated. As a member of the Leeds School Board, Mr. Peaker did such magnificent work that his presence on the city council was deemed a necessity, and last November he was re-elected by a phenomenal majority over his two opponents. He has been for many years something like an additional (unpaid) official of the Union, undertaking tenure investigations by the score, and also educational inquiries of a difficult and delicate nature. If incessant labour and unwearying self-sacrifice on behalf of his fellow-teachers can make a man "V.-P.," Mr. Peaker's success is already assured.

MR. E. R. PHILLIPS,

though still in the prime of life, is really one of the Union's "grand old men," for he is one of the very few still left to us who helped to establish the N.U.E.T. (as it was then called) in 1870. His professional experience has been both comprehensive and unique. At a somewhat early age he became a monitor—oh, those monitors!—in an infants' school. When sufficiently "old" he was indentured as a P.T. in a mixed school of some eighty or ninety in average attendance, in one of the most beautiful villages of beautiful Devon. After two years' college training (Exeter, 1867–8) he went as headmaster of a village school on the Atlantic coast of Cornwall; but six months there sufficed, his professional instincts compelling him to resist an attempted reduction of salary. He next served as assistant master for eighteen months in St. Thomas's School, Stepney, going thence to a small town school in Devon for four years. He returned to London as headmaster of the Alexis Street Board School, Bermondsey; leaving there twelve months ago, after twenty-eight years' successful labours, to assume charge of the Halford Road Board School, Fulham—his present school. To few teachers has such variety been allowed. Those, however, whose lot it is to work in provided or non-provided, urban or rural, boys', mixed, or infants' schools can rely on Mr. Phillips's prompt assistance and ready sympathy; for he has experienced, at first hand, the difficulties and anxieties of them all. Needless almost to state, he has been one of the most active and strenuous supporters of Unionism ever since 1870. For thirteen years, from 1871 to 1884, he never missed a general meeting of the Association to which he belonged. During part of that time he acted as Secretary of the South Devon and East Cornwall District Union, becoming its representative on the Executive in 1876. He was Treasurer of the

Mr. E. R. Phillips.

M.B.T.A. from 1877 to 1880, and its President in 1891. He has been twice President of the Southwark Association, first in 1879, and again in 1898. Much of his best work for the profession was done in connection with the M.B.T.A., and Mr. Phillips is pardonably proud of the share he had in securing the abolition of the old obnoxious C.P. regulations, and still more of the stand he took on the religious tests question. In municipal life he has served his fellow-citizens faithfully for over fifteen years, and three years ago was Chairman of the Camberwell Vestry. At present he is acting as Chairman of the Libraries and Museums Committee, which has the general supervision of six libraries, one art gallery, and one museum. He represented the South London Electoral District on the Executive from 1899–1903, and during those years made his colleagues feel and realise his value. He is absolutely in the front rank of platform men, stating his case with a clearness and a precision which make the admiring neophyte envious. He is a born debater, never using an unnecessary word. Of dignified and impressive appearance, cultured manner, convincing and earnest style, Mr. Phillips is a gentleman calculated to bring credit and renown to any office or position to which he may be appointed.

MR. T. P. SYKES,

the talented headmaster of the Great Horton Council School, Bradford, has been prominently before the teachers of England and Wales for a lengthy series of years. In the progressive city of Bradford he has long been a trusted and well-recognised leader of educational opinion, and is ever ready to "throw his cap into the ring" on behalf of his profession. Sometimes, we fear,

he has done this to his own disadvantage and at no little personal risk—notably on the occasion when he had the courage to direct the attention of the citizens of Bradford to the varying treatment meted out by the Corporation to the teachers and certain powerful municipal servants. For over twenty years Mr. Sykes has been a member of the Union. During this period he has held every important position at the disposal of his fellow-teachers. He has been President, Secretary, and (for eleven years) Treasurer of the Bradford Teachers' Association. He is a past-President both of the West Yorks. District Union and of the Bradford Teachers' Representative Association. He is a member of the Executive of the Half-Time Council, and the local Secretary of the Teachers' Provident Society. He is a life member of the "B. and O." Fund of the Union, and also an annual subscriber to the Church Benevolent Fund. For six years he has been a member of the N.U.T. Executive, and to-day occupies the responsible and exacting chair of the Tenure Committee, in succession to the indefatigable Mr. T. H. Jones. This chairmanship necessitates many hours'

Mr. T. P. Sykes.

weary travelling in frigid trains, many a lonely drive, and many fatiguing tramps; but Mr. Sykes is *semper paratus*. He has conducted personal investigations in order to safeguard the teacher's position in Yorkshire, Lancashire, Durham, Westmorland, Derbyshire, Lincolnshire, Norfolk, Suffolk, Surrey, and Wales, in addition to taking quite his fair share of deputation work. He has clear-cut views on both domestic and educational questions, and is never afraid of being in a "minority of one." He is in favour of a national system of education, with a free teaching profession. He is opposed to all religious tests upon teachers. He is in favour of one comprehensive register for all grades of qualified teachers. He strongly supports the establishment of a code of professional etiquette. He advocates improvement in the salaries of teachers, especially of rural and class teachers, and the employment of none but duly qualified teachers in public schools of all grades. He is in favour of the right of C.P. to all certificated teachers, and the complete civil and religious liberty of every teacher. He has been nominated by forty-six Associations, including Bradford, Brighton, Cambridge, Coventry, Derby, East Derbyshire, Dewsbury, Lincoln, Manchester, Nottingham, Rochdale, Runcorn, Sheffield, Walsall, Warrington, and is bound to poll exceedingly well. He is a lucid speaker, with a singularly taking style. He is an accomplished musician, and has lectured on "Practical School Music," to the delight of hundreds of teachers all over the country. The writer of this sketch never had a more pleasant experience in any school than during the solitary hour he was privileged to spend at Great Horton a year or two back. Children and teachers alike seemed radiant with happiness. Mr. Sykes can pen an article, either grave or gay, with the same ease and felicity as he can speak. It requires no great gift of prophecy to foretell that in two years, at the outside, he will be Vice-President of the Union.

SCHOOL TRAINING.

SOME DEFECTS AND SOME REMEDIES.

THE Board of Education has recently issued a report on the school training and early employment of Lancashire children, which should be of general interest to all concerned in education. An inquiry was undertaken by Messrs. Campagnac and Russell to discover how the schools have equipped working-class children (1) for life; (2) more narrowly, for their special work as wage earners. The result is not pleasant reading. After careful study, it seems too pessimistic. We are now accustomed to the repeated wailings and lamentations over the deficiencies of English education in all its phases; and although progress may result from a knowledge of such deficiencies, it would without doubt be pleasant to hear that there are points of excellence somewhere, the discovery of which would afford a little encouragement to the many earnest workers in the cause of education.

In attempting to answer the two questions above, the investigators were helped very largely by the replies of a number of boys and young men, fairly representative of the working class, and also by their personal knowledge of many working lads with whom they have been in constant relationship for some years. Information, too, was obtained from employers of labour, managers of schools, teachers, and others; but the main object of the report is to sketch the portrait of an ordinary working-class boy who has left school and been at work for four or five years—this portrait to depend mainly on what he himself says, and what he seems to think and to be.

A very great difficulty presents itself at the outset. While it is true that nearly all the boys of our great public schools, grammar schools, and similar institutions have an enduring sentiment of loyalty and affection for their school, this sentiment is not often met with in the case of those whose education was received at a primary school. One has only to think for a moment of the different conditions existing in the two cases to understand how this is. In the case of the children considered in this report, the majority leave before the age of fourteen, and are concerned immediately afterwards with obtaining in great part their own livelihood, and this does not furnish much opportunity for cultivating this sentiment, by the formation of

old boys' clubs, etc. The report, however, does not take sufficiently into account the great progress that has been made in this respect. Granting that this regard for his old school has a very faint existence in the case of the ordinary working-class boy, does it not follow that his other memories of the work done, the subjects taken, and the method of dealing with them are equally faint? The report gives at length the opinions of a young man on his school days, after an interval of thirteen years. This will be referred to later; but if the bulk of the information was obtained from similar sources, surely its value is somewhat discounted.

It is generally agreed that the benefits gained during a school course consist of the formation of habits of regularity and obedience, the sense of discipline and the knowledge of being under control, the value and effect of which are seen in the production of conduct and character.

Complaint is frequently made that the elementary schools hopelessly fail in the above training, to which it may be answered that, faulty and weak as such training may often be, it is almost alone in the school that it is attempted, and that the failure is due to the circumstances wholly hostile to such training in which a boy finds himself when he leaves school, and into which he is thrown, even while of school age, the moment he goes at the end of the day from the schoolroom door. Yet this work is accomplished most effectively when done indirectly, and it is necessary to inquire what impression the direct teaching of the ordinary school subjects makes upon the children. Do they leave school with a taste discovered and fostered for any particular subject? Are their powers of observation quickened? What do they like? Have they any special interests? Have they the capacity for taking an interest? What do they read? Do they read at all? These are some of the questions our investigators asked, and the answers obtained were deplorably bad. They say there is little evidence to suggest that a love of reading, a disposition to turn to books for amusement and pleasure, are, except in very rare instances, acquired in our elementary any more than in our other schools. One reason for this is the uninteresting and unattractive character of school books. (Many readers will differ from this conclusion.) Another reason is found in the fact that reading is often regarded as an end in itself, or else as the means to ends, useful, of course, but in their nature transitory—as, for instance, the deciphering of an advertisement of vacant situations. They very wisely point out that the school has to do far more for such children as are now being considered than for those of more fortunate surroundings, who get much of the best and most permanent elements of their education at home from their parents or in the nursery.

This school work, then, must be interesting if it is to be successful. An interesting book may do much, but the influence of an interested teacher will do more. There are many conditions, however, which tend to limit and dull the interests of the teacher. In the first place, he is too often expected to be able to teach all the subjects which the children have to learn, and they themselves are often overwhelmed by too great a number of subjects. It necessarily follows that all the subjects are not equally interesting to the teacher, and there is a considerable dissipation of energy in such a plan. Frequently, too, the teacher is overworked, the classes are too large, and there is very little chance of coming into personal relationship with his pupils. The conditions under which he works are often bad, and prevent his working efficiently and well. It is sometimes forgotten that the correlative of teaching is learning, and that children must not always be spoon-fed; they must not only receive information which is prepared for them, but must make some active effort on their own part to acquire it. Again: the value of school work would be greatly increased, and its progress made more pleasant, if teachers and parents could be brought into closer relationship, so that the teachers might have some knowledge of the circumstances in which their pupils pass their time out of school, and become acquainted, where possible, with the desires of the parents as to the future of their children; and the parents in their turn might know what their children are doing in school, and what progress they are making. An excellent suggestion, and most helpful when carried out.

It appears from the report that most children leave school without interests, and incapable of fixing their attention upon any reading except what is of the most fragmentary character. The letter above mentioned is here quoted in evidence. Its chief points are:—The school was a voluntary mixed, with lady teachers. There were five standards, which the writer passed through by the age of eleven, and then left. No drawing was taught; little geography, and less history. The writer and his chums looked forward impatiently to the time for leaving school and commencing work. They learned to distinguish nouns from verbs, how to parse, etc.; but could not understand the good of it, and had no interest in it. He blames the teachers, because they never tried to impress upon the pupils' minds the benefits of education. Then, of course, there was reading. If a larger word than usual was encountered, the teacher gave the right pronunciation; and if this was not correctly repeated by the scholar, he was punished with the cane. The teachers were far too imperious in their methods, and the cane far too often in requisition. They came to regard the teachers as so many tyrants and unfeeling slave-drivers. Since leaving school many books have been read, but reading at school gave no inclination to read any kind of literature when at home. There is very much more in the same strain, but enough has been written to give an idea of the whole. There is a necessary footnote to remind the reader that the letter is a review of the writer's own school days, and not of schools of the present day.

Since there is much valuable suggestion in this report, it is a pity space should have been found for such a letter, which cannot possibly be accurately descriptive of many schools of thirteen years ago. The second part of the investigation deals with the history of the schoolboy after passing through his standards, and indicates how he may obtain work, the nature of such work, its effect on his development, together with an attempt to discover if his school course has been of any service in preparing or assisting him for this work. Here the evidence of many employers of labour, and other people in a position to have authoritative opinions, has been gained, and the conclusions arrived at are worthy of very serious consideration. Very briefly they may be summarised as follows:—

The children seek employment at haphazard, and usually have no difficulty in obtaining it. The knowledge they acquired at school is of little or no use to them, and the work obtained is not educational, failing

to combine interest and pleasure. Schooling was a thraldom, work is a drudgery. The work is mechanical, and when once they have the knack of it they learn no more. They are satisfied till their seventeenth or eighteenth year, then desire more money. They don't get it, because they are of no more value to their masters than when they began. They can get unskilled labourer's work; but if they desire skilled work, they discover that their earlier education has not helped them, neither has the time spent since leaving school.

The conclusion of the whole matter is, that education must be made more real and helpful, that there should be more effective co-operation between parents and teachers, and that employers should unite with both in demanding and obtaining a suitable education. These requirements are national, as the defects are national, and these defects can only be cured when education is regarded as a national concern, and when the practical teacher, the educational expert, and the leaders of industry co-operate in obtaining the best possible.

EDUCATION IN RUSSIA.

SOME time ago we had the pleasure of describing in these columns certain phases of the "Common Schools of Russia," in which we attempted to show something of the reverse side of the pretty picture so generally presented by Russian officialdom for the edification of the foreigner. It will be remembered that, while we endeavoured to give full credit to the hopes and labours of the zemstvos (county councils, which Russia created years before Old England arrived at the same pitch of civilization), and pointed out the great progress already made, we strongly impressed upon the student of Russia the necessity of looking behind paper statistics, and, for example, when he read of a "school" with "scholars," to ask himself precisely what such words might mean elsewhere than on paper. We might have added that a great many of the schools included in statistics, especially the "church schools," have absolutely no corporate existence at all, and the scholars are a myth. The exertions of the zemstvo statisticians, whose labours have made them so much an object of suspicion to the ruling powers, have unmasked a certain proportion of these "paper schools;" but it is to be feared that no such result has followed the unmasking as would be the natural corollary in any other country in the world. Zemstvo statisticians have been in many cases entirely suppressed. They revealed too much of the actual state of the country. Even the supreme Government itself has found itself unable, from alleged want of funds, to work out the figures taken at Russia's first census (1897). The sceptical in Russia believe the matter has been dropped because of the undesirable revelations which would have to come out. The capitals, for their own sakes, have therefore found it necessary to hold a city census from time to time, and appear to find their account in providing the funds to properly work out the figures obtained.

The figures of the Moscow census taken early this year have just been published, and they have an interesting tale to tell of Russian education. Be it remembered that very recently Moscow was talking somewhat loudly of "universal education:" when closely examined into, this resolved itself into the "provision of school accommodation for all children of school age desirous of enjoying the benefits of education." This is, of course, a very different thing from "universal education" in any country. In Russia, where the restraints upon the use or abuse of child labour are practically non-existent, the difference is hardly describable in words. With the opening of the present school year, Moscow considers that it has at last attained the aim of providing school accommodation for all those eager to learn. The opening of three new schools enables this to be said, so that it may be judged the "premier capital of Russia" was not very far from the goal aimed at before this year of grace. And yet the census shows that the percentage of "illiterates" in Moscow is *forty-five*. As the mere ability to execute a laboured signature on the passport entitles a person to be entered as "literate," one must, to arrive at figures which will bear comparison with similar records of western European countries, add largely even to this appalling percentage of forty-five. Let us be as lenient as possible, and say that of the million odd people of Moscow, well over fifty per cent., or more than half, can neither read nor write. Moscow is the heart of Russia, and attracts to its mills and workshops and railways and trade establishments large numbers of peasants every year. Indeed the *muzhik* of the provinces has a child-like belief that Moscow is paved with coined money. Presumably it is not the worst of the country population, nor the least enlightened, which seek to better themselves in the premier capital. At what figure, then, shall we put the percentage of literates for the Central Provinces of European Russia, whose inhabitants most naturally, and in the largest proportion, gravitate to Moscow? Shall we put it at seventy-five or eighty per cent.? And then we reflect that these Central Provinces are at the heart of the empire, and have therefore something more than their fair share of any benefits of civilisation which Russia possesses. If we want to guess at the percentage of literates in the whole empire, we have to remember the vast conglomeration of races which go to make up the subjects of the Great White Czar. On the other hand, the percentage is very significantly improved by the natives of such portions of the empire as Finland, Poland, the Baltic Provinces—particularly the last. These parts of the Russian Empire owe nothing whatever to Russian civilisation, and therefore their institutions, educational among others, are very much more productive, sounder, and more real than the corresponding institutions of Russia proper. The percentage of literates in these provinces of an older civilisation than that of their present rulers must be largely allowed for. Still it would be perhaps too much to allow that they bring up the rest of the empire to the average attained by the Central Provinces of European Russia. On the whole, we may fairly and moderately assume, upon the basis of the latest statistics published in Russia, that the population enjoys a percentage of something like ninety illiterates to the hundred inhabitants. Reckoning literates according to the Russian manner, we should arrive at a rather larger percentage of persons able to sign their names; but as such persons would not come into a European census as literates, we are quite justified in putting the proportions as above. It will be seen what a herculean labour lies before the ever-striving zemstvos, whose efforts deserve more sympathy than they generally receive from the bureaucratic rulers at St. Petersburg.

MR. EDGAR D. FEAR.

IN the list of successful law students who, on January 26th, were called to the bar by the Benchers of Gray's Inn, appears the name of Mr. Edgar D. Fear, B.A., a sub-inspector of schools in North Devon.

Mr. Fear, who was born at Bristol in 1866, received his early education at the Bristol Grammar School, where he distinguished himself in classics. Under the excellent tuition of Mr. J. T. Francombe, he gained many local successes as a pupil teacher at Redcliffe Endowed School in the same city, and obtained a very high position at the Queen's Scholarship Examination of 1886.

In 1887 he proceeded to St. John's College, Battersea. Here he passed in the first division at each of the Certificate Examinations, and started his university course by matriculating at London.

In 1889 he returned to Bristol to take up an appointment as assistant master under the School Board, and

MR. EDGAR D. FEAR.

two years later graduated in the first division at the B.A. Examination. In the same year he was promoted by the School Board to the post of lecturer at the Pupil Teachers' Central Classes, and was appointed to the lectureship in French at the Voluntary Pupil Teachers' Classes.

In 1892 the Board of Education appointed him to an assistant-inspectorship in the West Riding of Yorkshire. His first chief was the late deeply-respected Mr. T. G. Rooper, H.M.I., whose ardent educational zeal inspired all with whom he came in contact.

Subsequently he had the advantage of serving on the staff of Mr. Philip Worley, H.M.I., a gentleman of rare practical educational knowledge and wide sympathies.

In 1902 he was transferred to Barnstaple to work on the staff of Mr. G. R. R. Routh, M.A., H.M.I., in the "Lorna Doone" and "Amyas Leigh" country, a not uncongenial change, we should imagine, to a west countryman after ten years amongst the mills and moors.

Mr. Fear had a successful career as a student at Gray's Inn. At the examination in Roman law, he shared with three other candidates the distinction of being placed in the first class.

A HISTORICAL PRESS.

IT is well known that printing was introduced into England by Caxton about the year 1475. It is generally stated that *The Game and Playe of the Chesse* was the first book printed in England, but it is probable that Caxton printed it abroad. But *The Dictes and Sayings of Philosophers*, a book translated from the French by Earl Rivers, contains the note, "Imprinted by me, William Caxton, at Westmynstre." The date of this book was 1477. Caxton carried on his business within the precincts of the Abbey, at a house called the "Red Pale;" and he died in that house in 1491. His immediate successor, Wynken de Worde, dated some of his books from "Caxton's house at Westminster," but he afterwards transferred his business to the "Sign of the Sun" in Fleet Street.

Another early printer was John Siberch, the friend of Erasmus. Erasmus was in England between 1510 and 1514, during the greater part of which time he was Margaret Professor of Divinity and Lecturer in Greek at Cambridge. No doubt it was largely owing to his influence that Siberch took to printing books at Cambridge, although we have no evidence that he worked earlier than 1521 or 1522. He is known to have printed eight volumes, one of which claims to be the first book printed in England in Greek characters.

We do not know why Siberch gave up the work, or whether his business was taken up by a successor. One thing, however, is certain. The ruling party in the University was determined to keep the production and sale of books as far as possible in its own hands; for in 1529 we find the University petitioning Cardinal Wolsey that, "for the suppression of error," there should be only three booksellers allowed in Cambridge, and these should be sworn not to bring in or sell any book which had not first been approved by the censors of books in the University. This petition, evidently actuated more by a desire to exclude heresy than to promote learning, did not take effect till 1534. The permission then granted by King Henry the Eighth for the University to appoint "three stationers or printers or sellers of books," who might print the books approved by the University, marks the addition of a printing-press to the educational appliances of the University. But it became in practice no more than a historical fact, without consequences. The printers had no place to work in, while the strictness of the censorship paralysed the efforts of the authors who might have supplied them with material. Books were sold at Cambridge, but none were produced there for more than half a century.

Nor did matters improve when the University, in 1583, appointed Thomas Thomas, a learned man, and Fellow of the King's College, to be University Printer. He set up a press, and began to print a theological treatise by an author of unquestionable orthodoxy; but suddenly the agents of the Stationers' Company, then newly incorporated, appeared upon the scene, seized the press, the plant, and all the printed sheets on which they could lay hands. A bitter controversy ensued,

which lasted, with varying success, till the middle of the Commonwealth. Then the University, emboldened by the turn which public affairs had taken, determined to make another effort to obtain the free use of their press. A new departure was made in 1655, by the appointment of John Field, "Printer to the Parliament." He had a press in London, which he continued to direct even after his appointment in Cambridge. Field's merits as a printer may not have been great, but the selection of such a man is important as showing a determination on the part of the University to put their affairs into the hands of a professional, rather than into those of an amateur. Every chance of success was given to Field. A lease of a suitable site opposite Queens' College was obtained, on which he built a printing-house. It is worth noting that this building, with additions, remained in use as the printing-office of the University until 1827.

These efforts, though well-intentioned, had but little stability; for in less than half a century afterwards we find a thorough renovation of the press in full progress, stimulated and directed by the energy of Dr. Richard Bentley. An addition was made to the buildings, new presses were procured, and new types were imported from Holland. The cost of these improvements was defrayed by a subscription, promoted, if not originated, by the Chancellor, the Duke of Somerset, and assisted by the Senate with £1,000 borrowed to make up the sum required. Then, or soon afterwards, the University undertook to manage the press for itself, by the appointment of a body of curators selected from the heads of Colleges and members of the Senate. Henceforward every book printed was sanctioned directly by them; they determined the price per sheet, and among other details appointed a competent person to correct the printed proofs of each work undertaken. The scheme thus inaugurated was no doubt successful up to a certain point; the works issued, either by the University itself, or by the booksellers allowed to use the press, were of permanent value; and the credit of the University, as a patron of literature, was greatly advanced. But the institution was badly managed from a pecuniary point of view, and a heavy deficit ensued. Various expedients were resorted to from time to time, but no real improvement resulted until the present permanent Syndicate of the Press was appointed in 1782.

The University Press of to-day, with its system of self-government, and consequent prosperity, may date its existence from 1782. The present buildings were begun soon afterwards, but part of the site had been secured twenty years before, and a warehouse had been built on it in 1786. From that time to the present day the site has been gradually extended, as opportunities for purchase presented themselves, so as to include nearly the whole area between Trumpington Street, Silver Street, Mill Lane, and the river Cam. The erection of the buildings has naturally followed the acquisition of the site. Of these the most conspicuous portion is the façade towards Trumpington Street. The cost of this was defrayed, in part, by the committee of subscribers for the erection in London of a statue of Mr. Pitt, who had represented Cambridge University in Parliament. When it was found that a considerable surplus would in all probability be left in their hands, they turned their attention to Cambridge, Mr. Pitt's own University, and proposed "to erect at their own expense, under the superintendence of the Syndics of the Press, a new building to be called the Pitt Press, between Silver Street and Mill Lane." The University accepted the proposal, and the first stone of the new building, designed by Mr. Blore, was laid by Marquess Camden, October 18, 1831, and completed in 1832. In consequence of the extent of this benefaction, the name of Mr. Pitt was for many years associated with the whole series of buildings; but the ancient designation has lately reasserted itself, and they are now referred to as the CAMBRIDGE UNIVERSITY PRESS.

CHILD STUDY AND THE TRAINING OF THE TEACHER.

(Continued.)

BY J. GUNN, M.A., D.SC.

IN the Normal College of Westfield, Massachusetts, the subject of Child Study is in charge of the professor of psychology, Professor Will S. Monroe, and he rightly regards it as the most important part of his course. When the students enter college, they have first to make some acquaintance with general psychology, especially with physiological psychology. This is a necessary preliminary to child study. During their first year they have to do a good deal of what is known as *reminiscence* work—that is, going back on their memory of their own childhood to realise how things looked to themselves when they were children. This kind of work does not lend itself to treatment in lectures; but the lecture method of instruction is not so general in America as it is among ourselves, which is perhaps a good thing on the whole. By these reminiscence exercises the students are led to realise some of the chief difficulties of children in the learning of the various subjects of school study, and to think how those difficulties may best be overcome. The exercises given form the bases of discussions in the class, which are superintended and summed up by the professor, but mostly conducted by the students themselves.

Another form of child study which is taken up in the first year is a simple *experimental* psychology—mainly the carrying out of sense tests, of sight and hearing, such as teachers are supposed to carry out for themselves in school in later years.

A third form of the work is *observation* exercises, directed to certain points agreed on beforehand, in accordance with a syllabus drawn up by the professor. This observation involves no experimenting with or questioning of the children. They are simply observed unobtrusively when at work in the practising school, or when at play, and the results are noted for future discussion in class. The utility of this exercise arises from the well-known fact that one needs to be *trained* to observe. Observation is not merely opening the eyes, or noting things at random. It implies being on the watch for certain facts, or facts of a certain class. It requires as much *shutting* of the eyes to irrelevant facts, or facts which have no bearing on the inquiry in hand, as it does of opening the eyes to other facts. Hence the need for a prepared syllabus.

What is a student expected to observe, in the playground, let us say? The topic may be a simple record of the forms of *imitation* displayed in the games which happen to be in season for the time. It may be a little more complex, as in an attempt to analyse the *interests* which determine the form of imitation observed. Games

as well as study, or even better than study, reveal the dominant interest in the child, which is shown by his attitude to any subject that comes before him.

I suppose we have all noticed children playing at "school." This is not, properly speaking, a game; but it is so in the sense of being a free exercise of energy, and it exemplifies the instinct of imitation of the occupations of grown-up people. Such imitation is always *selective:* the child can reproduce only a part of the adult activity. The part selected is an index to his *interest:* he neglects what does not interest him. Well, in playing school, what part of the real school is always chosen for representation and never left out? I need not describe it, for you must have noticed that the child who plays the part of teacher is careful to provide himself first of all with a serviceable cane, or something to take its place. I have never chanced to see a play "school" conducted for many minutes without a very realistic representation of what is known as "corporal punishment." Now, to a teacher this feature of school experience is by no means the most prominent, and is not of the essence of the play. But the fact I have mentioned, if you accept it as a fact, clearly proves that the cane (or its equivalent) bulks very largely in a child's mental picture of school. This is a fact about the child rather than about the school, but it is nevertheless a fact that the teacher should recognise. The child's impression may be false, but it is well that we should know just what it is. I mention this observation of a special interest revealed in play, not to found any serious advice on it, however, but merely as an example of the *kind of observation* which may be practised quietly and systematically, and from which much insight may be gained into the child's way of seeing things. To give any list of the points specified for observation by the students to whom I have referred is impossible at present. I only wish to illustrate the work, and to hint at its practical usefulness.

After the close of their first year's training, the students are required to do some original work in child study during their vacation. This usually takes the form of a detailed study of some individual child, if there be a specimen available at the student's own home, conducted in accordance with a plan arranged beforehand with the professor. This study does not, of course, wander over all the phenomena of the child's mind and body, but is concentrated on some aspect which the child's age renders at once possible and profitable. These vacation exercises are discussed in class or with the individual student on the reopening of the college.

During the second year more observation exercises are conducted in the practising school. A course of lectures is also given dealing systematically with the whole subject of child study. The student thus learns what has been done, and what yet remains to be done, in order that our knowledge of childhood may be fairly complete. He (or she, as one ought to say in this connection, for the student known to our education officials as a "male" is all but extinct in America)—she makes acquaintance with the best literature of the subject, and by the end of the year she is in a position to prepare an original thesis, which is always required for graduation.

During this second year there is one form of practical work undertaken which must be of much value in after years—at any rate to all who may have city schools of the poorer type to manage. Visits are made to various institutions where children of a defective type are treated, whether defective from the physical or the mental or the moral standpoint. Such institutions as schools for the mentally defective, asylums for children of a still more defective type, truant schools, children's hospitals, and the like, are included in this list; and in this way the students are introduced to what we may call the pathological aspect of child study.

In addition to the course for students, there are classes for teachers held on Saturdays. These classes deal with special problems, such as the problems of adolescence for high school teachers, and the like. In these special courses the work is often carried on in conjunction with skilled medical men, or again in combination with parents, represented by mothers' clubs or some such associations.

Such, then, is a brief and very imperfect sketch of the training in child study which one college in a small town in America is giving its students. There are many others where similar work is being done, and the number is certainly increasing, so far as I am informed. The aim is not to discover curious or rare phenomena, but to give young teachers an intelligent interest in their pupils, together with such a knowledge of their bodily and mental constitution and development as will guide the teacher in her efforts to guide the child. More than knowledge is needed for this. There must also be the habit of observing the individual children, so as to understand their needs.

A recent writer in England has said that the teacher must learn to watch the child as the sailor watches the weather. In these days of steamships the sailor can afford to neglect the weather even more than the teacher can afford to neglect the child. Like the sailor of a century ago, the teacher is entirely at the mercy of a force which is not within his control. This force is the child, with all his feelings, tendencies, instincts, powers, and weaknesses. This is the "weather" of the teacher. It may be favourable, and progress may be made on the desired course without any care or watching; but few mariners have a fair wind all the voyage. Still, the voyage must be made, and even contrary winds can serve the sailor who understands his business. Storms do not always mean shipwreck. Skill and care will make use of the most unpromising influences.

The course of training described may not strike us as a perfect one. Were we to draw up one for our own students, we might find it desirable to introduce some modifications. But it seems to have the merits of sanity and comprehensiveness. It lays little stress on the method which has done most to bring ridicule on child study—the method of asking direct questions of the children. As to the physical side, it lays stress on the senses, or the organs of sense. It also brings out the value of personal reminiscence of childhood. Its strongest point, in my opinion, is the place assigned to simple observation, both in work and in play.

In work, in an exercise in composition, for example, the pupil not only reveals his knowledge or ignorance of spelling and grammar; he also gives us an insight into his views of things, if it should be only by what he does *not* say on the subject of his essay. In the same way a free-drawing exercise, such as is common in American schools, shows not only the boy's power of drawing lines, but his *interests* as deciding him to select that point and to omit the other in his work. This kind of observation applied to the ordinary school exercises is probably the most instructive form of child study in which the teacher can engage.

The point which I wish to insist on at present is this, that for this or for any other method of studying children, some systematic training and practical work under skilled supervision is necessary. The teacher may, of course, learn for herself how to study her pupils, as the sailor may learn for himself to study the weather; but the success of the self-taught in any branch is not a good argument against training. It proves too much, and carries one back to the age of empiricism and quackery at a single step.

It may be of interest now to consider some of the ways in which child study *has already been of service* in improving education during the few years in which it has been before the minds of teachers and others. What the results of more systematic work would have been we can only conjecture.

Principal William Scott of the Toronto Normal School recently gave a useful summary of the educational results already accomplished by child study, in a paper read before the Dominion Educational Association at Ottawa, of which a notice appeared in the *Practical Teacher*. We quote the more important heads:—

"Child study has freshened and heightened interest in children, and has inspired the teacher with a greater reverence for the little lives entrusted to her care.

"It has shown that many so-called stupid children are suffering from growths in the nose or the pharynx, causing them to hear imperfectly. These can be removed by a surgeon, and the child at once becomes normal.

"It has shown that fine writing, small drawings, the intricate work of some kindergartens, and the use of the fingers in carving, in manual training, for young children, are all contrary to the law written in their nerve centres.

"It has shown that the strongest potential capacity in the child is that for action; that this capacity for action takes the direction of imitation; and hence every one who comes within the ken of the child becomes his teacher.

"It has shown that each organ has its nascent period, and that neglect at any stage of development is always expensive; that periods of interest correspond to the nascent periods of the motor organs; that the time of interest is the time of opportunity, and that neglect of this opportunity results in irreparable damage.

"It has supplied many useful lessons regarding fatigue. For example, mental fatigue is sooner induced where work is distasteful; the body wearies quicker when the mind is tired, and the mind more quickly when the body is tired: hence, to secure the best results with the greatest economy of time and effort, pupils should work well when at work, and frequent periods of rest should be provided.

"It has demonstrated that formal physical exercise, such as drill, heightens rather than dispels mental fatigue.

"It has shown that the time of physical growth is also the time of mental acquisition, and the old notion that rapidly-growing children, if normal, should be removed from school has been thoroughly disproved.

"It has shown that the period of adolescence is of supreme importance; that youths are now vulnerable to all kinds of temptations; and that genuine sympathy is necessary at this time to assist the youth into full manhood or womanhood.

"It has shown what can be taught to a child, and that children are much more interested in what an object can *do*, and what it is good for, than in its visible aspects.

"Because some children are eye-minded, some ear-minded, and others motor-minded, it is impossible to teach all in the same way."

Such is Mr. Scott's summary of the beneficial discoveries in education which child study can already claim. You may object to his list, and say that some of those things, at least, were known long before child study was heard of. This is quite true; but you must remember that the study of children has been going on in one form or another long before the present attempt to make that study systematic, and to reap from it the full benefits which it should yield in education. You must also remember that many very excellent educational maxims have long been held and practised by us only as traditions and rules of thumb; they had no sound or scientific basis, and were justified only by appeals to authority, or to their assumed results. What child study has done is to justify such rules by an appeal to the only safe criterion—the discovered nature of the child.

Instead of diminishing this list, I think we could easily enlarge it, even from our own experience at home. We might point to Sir James Crichton-Browne's investigations into school headaches and over-pressure in London schools, adding to his indictment that *all* pressure is for children over-pressure. We might point to the great work already going on in London, Glasgow, and other enlightened localities, for educating what we call exceptional children. We might quote what is being done in many towns to test sight and hearing in schools, and to treat individual children as their cases require. And finally, we may refer to the inquiry into the physical condition of our pupils generally, of which so much will be heard in the future.

And to return to the key-note of this discussion: the more that is being done, or that has been done, by child study for education, the more clear does it seem that a practical training in its methods, and a thorough acquaintance with its best results should form an integral part of the course of training given to our young teachers.

Possibly, as we have been considering the value of child study to the teacher, and the absence of any systematic attempt to train young teachers in all that is implied in the name, the thought may have occurred to some readers, Can we do anything to promote this part of the teacher's education? This question has been much in my own mind while thinking over the subject.

We have many institutions for the training of teachers in our land; and, taken collectively, they have one advantage which was mentioned in connection with American education—that is, they are not all bound to work on the same lines, or to aim at turning out just the same pattern of finished product. We have the older training colleges, which are under Government control to a certain degree, but to a much less degree than formerly, in the matter of curriculum. This new freedom provides room for any reform of this kind, if we can convince those at the head of the colleges that such a training is really a necessary or a beneficial thing for their students.

It would involve a change in the methods of studying psychology, for example. The experimental method is not much known in this country, and I am not aware of any one, except Professor Lloyd Morgan, who has seriously attempted it. Even the ordinary physiological

psychology seems less common than the abstract, empirical psychology of our universities. The change I should wish to see introduced would make the subject much more interesting to the students as well as more useful to them in after life.

Observation lessons are no new things in those colleges; but so far the observation of the student has been directed to the *teachers* in the practising school and their methods rather than to the children, even while they are at work, and the playground has not yet been generally included in the student's field of observation. But in these practising schools there are already provided the materials for such observation exercises as have been mentioned.

As to the reminiscence exercises, there is absolutely no new arrangement needed. It simply involves a discussion of certain subjects from the student's point of view rather than by the lecturer *ex cathedra*, and the substitution of inductive treatment for deductive. It is indeed possible that this is already being done by some of the lecturers; if it is not, its introduction might afford them a little agreeable change.

We have, however, a right to expect most in the way of experimenting from institutions which are still more free and uncontrolled in their curriculum than the training colleges referred to. The training colleges for secondary teachers in particular seem very favourably situated for making experiments and leading the way in such reforms as are needed. They have special advantages for helping to place education upon a scientific basis, and they will never accomplish this by keeping to traditional courses of the theory and history of education. Its history is a history of conflicting experiments, and its theory yet awaits a sound scientific basis. Without this, the study of curricula and of methods is mere empiricism.

But whatever the training colleges may find it possible to do, or think it desirable to attempt, it is evident that the chief responsibility for a really complete course of work in child study rests upon the universities. It is only in combination with the universities that the training colleges can be expected to train their students as we should wish.

The present is a most appropriate time for mentioning child study in connection with the teaching of education in our universities and university colleges. It has already been noted in this journal that the number of new appointments to chairs of education has been unusually large. From new men we may look for new methods. Notice was recently taken of the inaugural address of Professor Darroch of Edinburgh University, the home of education as a university subject. We may be pardoned for referring to that address once more:—

"It should be the aim of the chair to lead the student to understand that mental activity is throughout conditioned by physiological processes; that ignorance or neglect of these conditions impedes and hinders mental development. It must further show the principles which govern and condition mental development....."

Now in these sentences the professor grants precisely what I am contending for in the training of the teacher.

The interesting question then crops up, How is the view of education presented in this address to be realised? It is not enough to teach the student that he must know the laws of physiology and psychology concerned in education before he can become a teacher. The student must actually be put in the way of *learning* those various laws. And this at once carries us far beyond the work possible for one chair. It implies a Faculty of Education. It certainly demands a treatment of education in the university more in accordance with the importance of the subject than anything yet existing in this country.

We need a special course in physiology, different from that of the medical faculty, with a view to the general physical care of the pupil; and we need another course in the physiology of the organs of sense. The brain and the nervous system will need a special study from the point of view of development and growth, both in normal children and in the more common cases of defects which require special treatment from the teacher. Physiological psychology and practical and experimental psychology, as well as the psychology of childhood, must be recognised here, as they already are in other countries, and the subject of psychology will then become one of the teacher's best aids in his practical work.

But I need not go on. I have said enough to indicate the far-reaching nature of the change which the adequate training of teachers will necessitate. There is no need for us to assume that such changes are impossible. Once we are thoroughly convinced that they are desirable and necessary, we shall also find that they are possible.

CONCERNING FATIGUE.

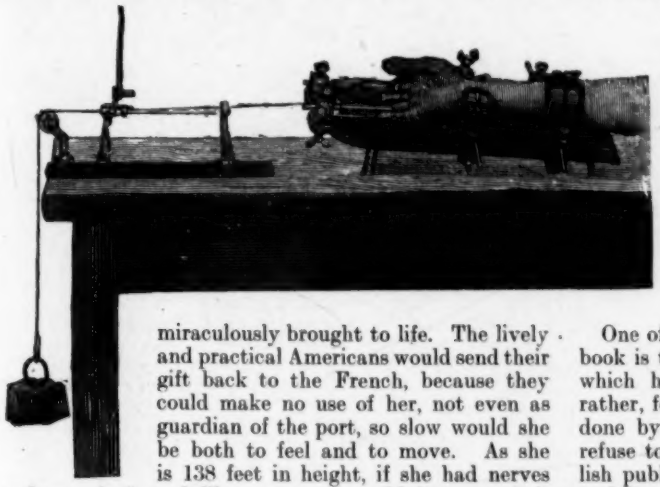
THE inquiry now proceeding into the general physical conditions of school children, and the other indications of an increased tendency to consider education from the aspect of the pupil rather than of the curriculum, are pressing upon all teachers the necessity for clearer ideas and more exact knowledge of the physical side of education. Questions of pressure and overpressure, of nutrition and growth, and of the fatigue caused by school work as a whole and in special departments, are pressing for practical solution.

Teachers will welcome the appearance of a work by Professor A. Mosso, of the University of Turin, entitled *Fatigue*, translated by Miss Margaret Drummond, M.A., and Dr. W. B. Drummond, author of *The Child, his Nature and Nurture*. It is a charming book to read, discursive and almost gossipy in parts, but with a wise discursiveness which narrows down to a close and clear enunciation of the positions which have been illustrated, and yet in its most technical discussions entirely free from the puzzling use of technical terms and ideas which make many special monographs hard reading for the layman. As to the language, one need only say that the book bears no trace in its style of having suffered violence at the hands of its translators; it stands before us in free, idiomatic English, without a trace of its foreign origin.

We are introduced to the writer in unconventional surroundings; not in his laboratory at Turin, but on the seashore near Rome, where, gun in hand, he begins to study the effect of fatigue upon the muscular and nerve systems of the migrant birds after their long flight across the Mediterranean. We next join him in his pigeon-house, where he learns something further from the condition of his carrier pigeons after a long journey. There is a freedom and directness about the investigation which makes it easy to follow.

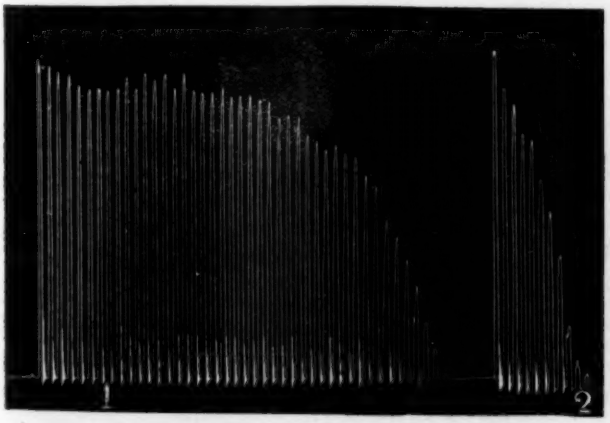
Even when he has to impress on us facts learned by close laboratory research, he puts them in such a way that we learn them without effort and even with pleas-

ure. The slow rate at which impulses travel through our nerves he illustrates thus: "By way of illustration, let us suppose that Bartholdi's statue of Liberty, which has been erected in New York harbour, were



miraculously brought to life. The lively and practical Americans would send their gift back to the French, because they could make no use of her, not even as guardian of the port, so slow would she be both to feel and to move. As she is 138 feet in height, if she had nerves and a spinal cord like ours one would have to wait about four seconds after touching her foot before she would give any signs of sensation and begin to move."

A considerable part of Professor Mosso's work is occupied with the study of what muscular fatigue really means. His answer is that the sensation and the phenomena of fatigue are due to a temporary poisoning of the system with the waste products of movement, which are produced more rapidly than they are removed, and have a toxic influence upon the blood. If a muscle removed from a dead animal is stimulated by a series of electric shocks, it gradually ceases to respond. If now it is washed out by forcing a saline solution through the blood-vessels, it is once more able to respond to the electric stimulus until it is again charged with the waste products of its contraction. He also shows us that all the symptoms of fatigue can be produced in an animal under the influence of an anæsthetic by simply injecting into its veins some of the blood of another animal which is suffering from fatigue.



The toxic poison of fatigue is produced, not only by the expenditure of muscular energy, but still more readily by the expenditure of nerve energy. Here we come upon ground which borders the field of education, if it does not actually fall within its limits.

"Undoubtedly brain work, to those unaccustomed to it, must cause more fatigue than exercise of the muscles. MacCauley relates the story of some Indians in Florida whom he interrogated with persistence, with the result that they very quickly became quite paralysed, so rapidly did the strain of attention exhaust the energy of their brains. One of them asked him not to ask any more questions without giving him time to rest, so that he might be the more able to understand; and afterwards begged that he would return next year to interrogate him, saying that he would go to school in the meantime, and that he would undoubtedly answer better afterwards, and without so much fatigue."

One of the most interesting parts of Professor Mosso's book is the description of the ergograph, an instrument which he invented for the measuring of fatigue—or, rather, for measuring the amount of work which can be done by one muscle before it becomes so fatigued as to refuse to act any longer. By the courtesy of the English publishers of the book (Messrs. Swan Sonnenschein and Co., Limited), we are enabled to reproduce a drawing of this ingenious machine, and of two typical records made by it. The illustration renders description unnecessary. The middle finger alone is free to move, and in bending it is made to raise a weight of two or three kilogrammes. The person experimented upon bends his finger once every two seconds, the rhythm being given by a pendulum, and each flexure leaves a tracing by means of a needle-point which marks the distance traversed by the weight. The total length of the upward vertical lines indicates the height to which the flexor muscle of the finger was able to raise the weight in its successive efforts before it entirely refused to act. We must refer our readers to the book itself for many interesting revelations regarding fatigue which this machine has made.

The second of our illustrations is specially interesting to teachers. It represents two records made by a colleague of the author on the last day of a series of arduous oral examinations in medicine which he was conducting. The first of the two tracings was made immediately before entering on the day's work, and the second after examining nineteen candidates. It gives a graphic idea of the amount of fatigue caused to the examiner, and will doubtless make some of our readers wish that we had been able to give similar records for the students examined.

Professor Mosso's work does not deal directly with children, though he has many wise and weighty words regarding attention, over-pressure, and the like. But his ergograph can be adapted to children as well as to adults. In this connection we quote the following from the translator's preface: "Those interested in education have not been slow to see how this instrument may aid them in their special study, and with it various observations have been made on school children with the object of ascertaining the degree of fatigue attending different studies, the time of day when they can be most profitably pursued, and the best division of the school day as regards play and work."

Dr. Drummond will lay English teachers under a great obligation if he will publish the detailed experiments which are being made abroad, and his deductions on them

ADMISSION EXAMINATION FOR PUPIL TEACHERS, 1904.

CONSIDERABLE doubt exists as to the way in which the New Regulations for the training of pupil teachers will be introduced. We trust that the following circular which has just been issued to the Local Education Authorities will make the position clear.

BOARD OF EDUCATION, WHITEHALL, LONDON, S.W.,
7th February 1904.

SIR,—1. The Collective Examination held by the Board of Education for enabling Candidates to qualify for engagement as Pupil Teachers, in accordance with Article 35 of the Provisional Code for 1903, and Article 9 (*b*) of the Regulations for the Instruction and Training of Pupil Teachers, will take place on Saturday, May 14, 1904. A Supplementary Examination for the benefit of those Candidates who, owing to illness or some other sufficient reason, are not able to attend on the earlier date, will take place, if required, on Friday, May 20th.

2. It appears to the Board that the names of those boys and girls who desire to offer themselves for examination may best be collected by the Local Education Authorities for Elementary Education. H.M. Inspectors have therefore instructions to arrange with these Authorities for Centres at which the examination can most conveniently be held. Suitable schedules for the names of Candidates will be issued by the Board. The names should be entered on these by the Authority in triplicate, and in strict alphabetical order. The Inspectors will subsequently record upon them the success or failure of each Candidate, and will forward one copy of each schedule to the Authority, and another to the Board.

3. The Collective Examination is open to all suitable Candidates without regard to religious belief. It is not necessary for admission to the Examination that a Candidate should have received a nomination to a Pupil Teachership in any particular School.

4. The names of Candidates for the Examination may be received by the Local Education Authority, either by direct application from the Candidate or through the Managers of Schools, whether Elementary or Secondary, within the area. Instructions with regard to the various grades of the Examination and the conditions under which it is held are appended to this Circular.

5. An Authority may properly refuse to accept the name of any Candidate who will not be old enough for engagement as Pupil Teacher within two years of the date of the Examination, or who fails to send in his name by a date to be fixed by the Authority. Candidates who for any other reason are obviously unsuitable may be rejected by the Authority, with the consent of the Inspector.

6. The Local Education Authority should require from the parents or guardians of each Candidate a statement in writing of the desire of the Candidate, if successful in the Examination, to serve as a Pupil Teacher. But it must be understood that the Examination conducted by the Board will be merely a qualifying Examination; success in it does not necessarily confer a right to employment as a Pupil Teacher.

7. It is at any time open to the Local Education Authority or to the Managers of a Pupil-Teacher Centre to submit to the Board of Education a scheme for an Examination of intending Pupil Teachers to be held by themselves in lieu of the Board's Collective Examination, in accordance with Article 9 (*c*) of the Regulations for the Instruction and Training of Pupil Teachers. The Collective Examination for 1905 will be remodelled with a view to making it a general test of proficiency, which can be passed without the necessity of preparing special books or subjects by Candidates who have been instructed in accordance with the ordinary curriculum of a Secondary School or a Preparatory Class.

8. It is desirable at this juncture that every Local Education Authority should consider closely the various problems connected with the supply, not only of Pupil Teachers, but also of Adult Teachers, for the Elementary Schools throughout their area, and that they should then estimate approximately the number of Pupil Teachers that will be required in the area during the year or two years next ensuing after the date of the Examination, in order to provide, in the future, an adequate supply of students qualified to enter the Training Colleges, and, subsequently, to improve and increase the Teaching Staffs of the Schools.

9. It will be remembered that the Prefatory Memorandum issued by the Board in July last with the Regulations urged the necessity of establishing "in every area some effective means for drawing candidates for the teaching profession from among the most intelligent and capable boys and girls attending the Elementary and Secondary Schools." The steps taken in regard to the approaching Collective Examination for the admission of Pupil Teachers will furnish an opportunity for initiating this much-needed procedure in the areas of the various Local Authorities. Full information as to existing and future vacancies for Pupil Teachers and as to the Collective Examination should be sent by every Local Authority to all Schools, both Secondary and Elementary, from which Pupil Teachers are likely to be drawn; and the Board trust that your Authority will also take every step in their power for bringing home to the parents of school children throughout their area a knowledge of the fact that this door to the teaching profession is now thrown open in a manner and to a degree not hitherto possible.—I have the honour to be, Sir, your obedient servant, ROBERT L. MORANT.

To the Secretary to the Education Committee.

N.B.—The greatest care should be exercised to ensure that every Candidate is entered upon the proper Schedule, and receives the proper papers for the Grade in which it is desired that he should be examined.

INSTRUCTIONS.

A.—The papers set for the 1904 Examination will be of four Grades, and will be distinguished, together with the corresponding Examination Schedules, by numbers and also by colours, as follows:—

Grade I.—Yellow. (Subjects specified for Candidates for a one-year's engagement in Schedule V. of the Provisional Code, 1903, and Schedule II. of the Pupil-Teacher Regulations, 1903.)

Grade II.—Green. (Subjects specified for Candidates for a two-years' engagement in the Schedules.)

Grade III.—Brown. (Subjects specified for Candidates for a three-years' engagement in the Schedules.)

Grade IV.—Pink. (Subjects specified for Candidates for a four-years' engagement in Article 39 (*b*) of the Code.)

The Local Education Authority should inform H.M. Inspector, not later than April 9th, exactly how many Candidates will require examination in each of these four Grades. In determining the Grade in which a Candidate is to be examined, the following points should be kept in mind:—

1. Candidates who are old enough for appointment as Pupil Teachers from the 1st of August 1904 should, as a rule, be presented in Grade II.

2. Candidates who are not old enough for appointment from the 1st of August 1904, or who are not prepared for examination in the subjects prescribed for Grade II.—

(*a*) May be examined in Grade III., and, if they subsequently receive a year's full time instruction in a Secondary School or a Preparatory Class, be appointed as from the 1st of August 1905 without further examination; or—

(*b*) May, if they are old enough, and have been actually instructed as Pupil Teachers and employed in Public Elementary Schools since the 1st of January 1904, be appointed for a period of three years from that date.

(*N.B.*—The Board do not propose in future to admit any Pupil Teachers who have not previously passed a qualifying examination; but, in view of the necessarily transitional nature of the arrangements for the current year, they will, for it alone, continue their former practice in this respect.)

3. Candidates for a shortened term of engagement of one year, under Article 8 of the Pupil-Teacher Regulations or Article 40 of the Code, should be examined in Grade I.

4. Candidates, for whose appointment in rural schools for a period of three years the special consent of the Board is to be asked under Article 8 of the Regulations, should be examined in Grade III.

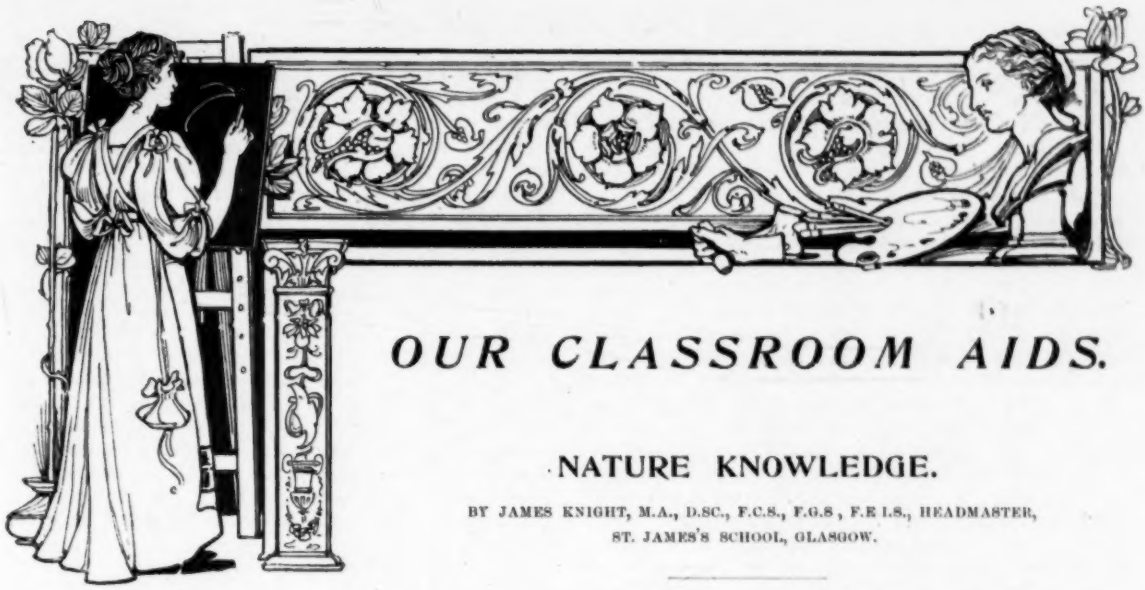
5. Candidates, for whose retrospective engagement in rural Schools for a period of four years from the 1st of January 1904 the consent of the Inspector is similarly to be asked under Article 39 (*b*) of the Code, should be examined in Grade IV.

B.—The Examination will begin at an hour to be arranged by the Local Education Authority and H.M. Inspector; and Candidates will be supplied with exercise books and blotting paper. No book or writing from which answers may be copied, and no instrument or material for writing except pens, ink, pencil, knife, india-rubber, and ruler may be brought into the Examination Room.

Candidates in Grade IV. are not examined in Needlework. All other girls must provide themselves with the necessary materials and appliances for working the prescribed exercises in that subject.

(See "Needlework" Column, 10 (*b*), in Schedule V. of the Code, 1903, and Schedule II. of the Pupil-Teacher Regulations.)

C.—No Candidates for recognition as Probationers under Article 33 of the Code for 1903 will be examined at the Collective Examination. Such Probationers may, however, be presented to H.M. Inspector at his visit to any Public Elementary School, or at the Centre at which the Collective Examination is held. No such Probationers will be recognised for the first time from the 1st of August 1904, or any later date; but Probationers previously recognised may continue their services until the age of 16.



OUR CLASSROOM AIDS.

NATURE KNOWLEDGE.

BY JAMES KNIGHT, M.A., D.SC., F.C.S., F.G.S., F.E.I.S., HEADMASTER, ST. JAMES'S SCHOOL, GLASGOW.

LESSONS ON FOODS: PROTEIDS.

THE third great division of food-stuffs, and in many respects the most important, is that known as the Proteid foods. They are also known as flesh-formers, nitrogenous, albuminous, albuminoids; and to some of these names little objection need be made. They are called flesh-forming foods because flesh is nitrogenous in composition, and these are the only foods containing nitrogen. It must not be forgotten, however, that flesh contains much more than nitrogen, and that other food-stuffs may equally share in flesh formation. As a matter of fact, all foods form flesh. Even water does so to a very large extent, a fact not surprising when we are told that our "too, too solid flesh" contains seventy-five per cent. of water. The name "flesh-forming" foods further belongs to the old time when certain foods were supposed to be useful for this purpose, others as "heat-givers," and so on, a theory now exploded. Every food which contains available fuel has a right to be regarded as a heat-giver, and every food which contains any one of the materials of flesh may become a flesh-former.

The name nitrogenous is innocent in itself, but is easily abused. All proteids contain nitrogen, but all nitrogenous foods are not proteids; and there are many nitrogenous substances which are not foods at all. Many artificial foods, notably meat extracts, are highly nitrogenous, and are "boomed" as such, but their nitrogen is not present in a form capable of assimilation. A diet of hair or nail-clippings would be very nitrogenous, but could scarcely be called food.

The term albuminous throws us back upon albumen, the type of this class of foods, and familiar in the form of white of egg. As we shall see, however, the albumens form only one division of the proteids, and therefore a wider name is advisable for the whole class. The name albuminoids was proposed to meet this difficulty, but of late years this term has become restricted to bodies of the gelatine type, which resemble albumen in some respects, and therefore may fairly be called albuminoid. If "proteid" is considered too techincal, use "nitrogenous."

Unlike starches, sugars, and fats, the proteids are very complex bodies, and no definite chemical formula can be given for them. They all contain carbon, oxygen, nitrogen, hydrogen; most of them contain sulphur and phosphorus as well, and some of them iron in addition. Their composition is shown by the annexed analysis:—

Carbon . .	51·5 to 54·5 . .	average 53·5 per cent.
Oxygen . .	20·9 „ 23·5 . .	„ 22·4 „
Nitrogen .	15·2 „ 17·0 . .	„ 15·5 „
Hydrogen .	6·9 „ 7·3 . .	„ 7·0 „
Sulphur . .	0·3 „ 2·0 . .	„ 1·6 „

The gelatin group has little or no sulphur. Casein, the basis of milk curd and cheese, contains phosphorus; while hæmoglobin and its allies from the blood contain iron. The above table shows that proteids have a good right to be called carbonaceous foods, or even heat-givers, from the amount of combustible matters present. Fully half their weight consists of carbon, nearly a quarter of oxygen, while the nitrogen which names the group in popular talk forms only one-seventh.

To show the chief properties of proteids, several very interesting experiments may be made, and for this purpose white of egg may be used, as this is almost pure albumen mixed with water. Take some white of egg and shake it up with water in a test-tube: the white dissolves entirely; and this is true of all the albumens proper, including egg albumen, serum albumen from blood and lymph, cell albumen, lactalbumen from milk, and muscle albumen from meat juice. Now heat gently the contents of the test-tube, using a thermometer as stirrer, and noting the temperature at which changes occur. The mixture becomes cloudy at 60° C., and at 73° C. all the albumen is coagulated into the firm, white solid mass familiar enough when eggs are boiled or fried. The presence of albumen in urine is detected in the same way. Heat some urine in a test-tube. Should a white cloudy precipitate form, add a drop or two of acetic or nitric acid and heat again. If the white deposit clears away, it was nothing but phosphates, which are quite normal; but if the white deposit persists after treatment with acid, it is coagulated albumen, generally an indication of kidney disorder.

Take some more white of egg, and this time drop it into four times its own bulk of alcohol—that is, spirits of wine. Whisky or other common spirit will do; but it is to be remembered that these spirits, even when

pure, contain only fifty per cent. of alcohol. Alcohol coagulates albumens and globulins, making them quite leathery in a few minutes—a valuable demonstration of the effects of alcohol on all living tissue. Show the hardness of any animal specimen which has been preserved for some time in spirits.

Now take any solid proteid—the white of a boiled egg will do very well, or a small piece of dried meat free from fat. Heat this gently in a dry test-tube, and observe what happens. The substance decomposes, giving off ammonia and other more offensive gases, and is finally charred, showing the presence of carbon. Repeat this with dry meat powder or very stale cheese powdered down, mix with soda-lime, and warm gently. Ammonia gas is driven off, easily recognised by its characteristic pungent odour, and by its effect on a strip of red litmus paper held above the mouth of the tube. Since ammonia has the formula NH_3, the production of this gas from meat or cheese reveals the presence both of nitrogen and hydrogen. Sometimes soda-lime is unable to decompose proteids, and in that case we adopt the method of Kjeldahl, used by all analysts. For class purposes a simple test is all that is wanted, and that may be done as follows. Dry the proteid substance as thoroughly as possible, put it in a small dry flask, warm it with strong sulphuric acid till dissolved; then add excess of caustic soda, a drop of mercury, and a few scraps of zinc; then warm gently. The strong acid decomposes the proteid, charring it at the same time and removing any moisture present. The mercury acts as an oxygen-carrier, so that all the nitrogenous material present is converted into nitrates; while the zinc, acting on these nitrates as fast as they are formed, converts them into ammonia gas, detected as before.

An easier and at the same time characteristic test for proteids is to moisten them with strong nitric acid. They turn bright yellow, and on adding ammonia or other alkali the colour, instead of disappearing, deepens to brown. This may be done with boiled white of egg, or even with the skin. Solid proteids also stain deep yellow to brown with iodine, another experiment which may be done on the skin. Other tests—such as the biuret reaction—may be found in any physiological textbook, but they are not of sufficient practical importance to be shown in school work.

It has been seen that albumens are all coagulated by heat and by alcohol. A very instructive set of experiments may be shown to demonstrate what may be called natural coagulation—coagulation by ferments. Three good examples of this may be found. Add a little rennet to milk, so as to form a curd in the usual way. This coagulates a proteid present in the milk-fluid, turning it into casein, the basis of curd and so of cheese. Take some fresh milk and drop into it a little of any acid, say the juice of a lemon. This produces a similar curd of casein, not quite the same as in the former case, and caused by the action of acid alone, apart from a ferment. Another well-known example of coagulation due to a ferment is the clotting of blood. When blood is drawn into a vessel from the veins of a sheep, in less than three minutes the whole mass forms a solid red jelly. When the clot is older it hardens and contracts, squeezing out a pale liquid, the blood serum; and it may now be taken out and washed till the red colour disappears. What is left is an amber-coloured mass of fibrin, a coagulated proteid formed out of blood by a ferment, not introduced from without, like rennet, but formed within the blood itself. The stiffening of a body after death, known as *rigor mortis*, is explained in the same way. It is the coagulation of muscle albumen forming solid myosin under the influence of a ferment developed shortly after death. The services of a local butcher may be enlisted to procure fresh blood, and some of this should be immediately stirred up with a bunch of twigs or any other stirrer with a large surface. This encourages clotting, and at the same time removes the fibrin as fast as it is made, accumulating a yellowish, stringy mass of fibrin in the stirrer, and leaving in the vessel a red liquid which does not clot—defibrinated blood, in short—which may be used to show the chemistry of respiration and the exchange of blood-gases.

The skin which forms on the surface of heated milk is another example of coagulation by heat. For a long time this skin was supposed to be milk albumen or lactalbumen alone; but it has been clearly shown that most of it is really altered casein with fat entangled in it—a sort of cream cheese, in fact. This is a point of great importance in the treatment of cows' milk for infant feeding.

It is maintained by many that there is a similar coagulation when wheaten flour is kneaded with water so as to form a paste or dough. Take some wheaten flour in a muslin bag, and work it with the fingers under a stream of water. This washes away all the starch as a milky stream, but on opening the bag a yellowish sticky mass is found—the so-called gluten—which enables wheat to form a dough, and thus be baked into loaves. This crude gluten is really a mixture of proteids, together with small quantities of non-proteid materials which have escaped the action of water.

Chemists now recognise in gluten two leading vegetable proteids, glutenin and gliadin, and it is the latter which forms a dough with water. Wheat flour contains five proteids, thus :—

An albumin (leucosin) . . .	0·3 to 0·4 per cent.
A globulin (edestin)	0·6 to 0·7 „
Proteoses	0·3 „
Glutenin	4·0 to 4·5 „
Gliadin	4·25 „

The first three are of slight importance. Wheat is the only seed rich in gliadin, and therefore wheat flour is the only flour capable of yielding a sticky dough on adding water, and therefore of making bread. Rye flour contains a little gliadin, and so ranks next to wheat in this respect; but barley and oats have only traces of gliadin, and so cannot be baked into loaves, though they may form cakes. There is hardly any gliadin in leguminous seeds like pease, beans, lentils, etc., but they contain another proteid—legumin, or vegetable casein.

The following table from Halliburton exhibits the simple animal proteids :—

I. Albumens, soluble in water	Egg albumen, serum A. Cell A., muscle A. Lactalbumen.
II. Globulins, insoluble in water	Fibrinogen, serum globulin. Myosinogen, myoglobulin. Crystallin, vitellin.
III. Derived albumens . . .	Acid albumen, or syntonin. Alkali albumen, or albuminate.
IV. Proteoses, intermediate products of digestion.	
V. Peptones, the chief end-products of proteid digestion.	
VI. Insoluble proteids, including fibrin, casein, myosin, and other proteids coagulated by heat or alcohol.	

We have received from Burlington House, Cambridge, the London University Guide and U.C.C. Calendar. This gives the full regulations respecting London degrees, and much valuable advice for getting them. The Matriculation Directory (No. 36) is invaluable to all candidates.

NOTES OF LESSON ON BUDS AND CATKINS.

Class.—Boys and girls in Standard IV.

Time.—Two lessons of 40 minutes each.

Aims.—Without going at all deeply into the subject of botany, children should know something of the growth of plants. Nothing impresses the fact that trees and plants are living things so much as watching their gradual growth and development. Whether this is

SEED FLOWER.

TRANSVERSE SECTION OF SEED BOX.

shown by means of plants grown in the schoolroom, or by directing the attention of the children to the various stages of growth in the trees and plants about the school, the result is the same—the children realise more vividly that these are living objects, and are led to extend to them the same loving interest that they instinctively show to all members of the animal kingdom.

Step I. Preparation.—Let each child have a twig on which are two or three buds. Catkins from the willow or birch should also be provided.

Step II. Presentation.—*Position of the Buds.*—Let each child examine a twig carefully, and notice where the buds occur. They are found either at the end of the shoot—*terminal buds*—or in the axil of the leaves—*axillary buds.*

Structure of the Bud.—Let the children dissect their buds in the following ways :—

1. Remove the bud-scales, and note the young foliage leaves within. If these are removed carefully one by one, the growing point is found in the centre.

2. Make a longitudinal section of the bud, and draw a diagram showing the growing point, the leaves, and the bud-scales.

3. Make a transverse section of the bud, and note the arrangement of the individual leaves in the bud, and also the arrangement of the several leaves around the growing point. Thus individually the leaves may be folded in half along the midrib, as in the bud of the bean; they may be folded in a number of beautifully regular pleats, as in the birch; they may be folded irregularly, and therefore called crumpled, as in the poppy-bud; they may be rolled from the two margins, either inward, as in the violet, or outward, as in the dock; or they may be rolled from the apex to the base, as in the fern.

POLLEN FLOWER FROM CATKIN.

Tillering.—A careful examination of the twig shows that all the buds have not begun to open, many of them still remaining tiny points. These are dormant buds which the tree keeps in reserve in case of accident. After the buds have begun to open in the first warm days of spring, they are often cut off and destroyed by a late frost. If all the buds had opened together, a frost would destroy the whole of them, and there would be neither leaves nor fruit; so Nature wisely keeps a stock of buds in reserve, which will become active if the other buds are destroyed.

If the dormant buds are not required, they form little knobs under the bark, which will burst out into little branches should the trunk of the tree be cut down. This is known as tillering.

Flower-Buds.—In their earliest stages the flower-buds and leaf-buds are alike, and the most careful examination gives no indication of the final stage. This is not surprising when we examine a flower and find that it is only a modification of a leaf. It is most important, then, that we should ascertain the causes that lead to some buds becoming leaves and others flowers. Although we cannot give the exact reason, it is found that if a tree receives an abundance of stimulating liquid food it will "run to leaf;" but if the nutrition is checked by judicious pruning, a greater proportion of buds will become flowers.

Catkins.—The approach of spring is always heralded

POLLEN CATKINS.

by the appearance of the catkins on the hazel. They are to be found toward the end of February and the beginning of March.

Two kinds of Catkins.—1. Now look carefully at our hazel twig. You will notice clusters of drooping greenish-gray tassels. Shake the twig—you see a shower of golden rain. These tassels are the "pollen catkins," for pollen is the name of the golden dust which they contain. Pollen is a favourite food of bees and other insects. It has also another use, which we shall see presently. Examine one of these "pollen catkins." You find a stalk on which are seated a number of tiny little flowers. Those at the bottom are larger than those at the top, for they are older. You do not think much of them as "flowers," I dare say, but they are quite as useful as the more attractive ones. Each of these flowers consists of little bracts or scale-leaves, to each of which are attached eight tiny stalks with little yellow bags at the end holding pollen.

2. Now I am pointing to some different blossoms. Perhaps you have been thinking they were buds tipped

with red. These are called "bud catkins." These also consist of tiny flowers, although there are not so many

Bud Catkins, with Seed Flowers.

as in the pollen catkin. Shake one. You do not see any yellow dust fall this time, for the flowers are quite different. Pick one out with a pin. It is shaped like a tiny bottle, with two little red horns at the top. Let us cut one across and look with our lens. You have found a tiny box with a division in the centre and a little white seed in each. One of these will by-and-by become a nut, while the other will wither. Look for these in the autumn.

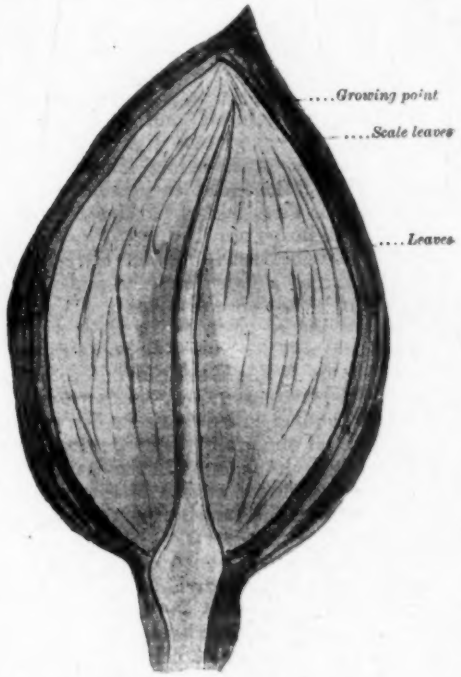
Function of the Catkins.—The work of these modest

little flowers is to produce fertilised seed, which will in turn produce new plants.

Fertilisation.—In order that the seeds may grow, it is necessary that some of the golden dust of the "pollen" catkins should fall upon the little red horns of the bud catkins which hold the tiny seeds. The wind is the great agent by which this is achieved; hence the quantity of pollen produced allows for waste. Note that the relative positions of the catkins assist in fertilisation.

Step III. Association.—During the lessons many illustrative associations will occur to the teacher. Thus the brown scale-leaves of the bud are like a greatcoat protecting the tender bud from the cold; or, again, the various methods of vernation can be illustrated by means of pieces of paper folded around a lead-pencil.

Having dealt with the special case of fertilisation in the hazel, other types should be dealt with as they occur during the successive weeks, and compared one with another. Thus, in the willow, the male flower is on one tree and the female on another. Here the pollen is carried by bees and other insects, which are attracted



Longitudinal Section through Leaf bud.

by the scent and honey. In this way the children will be led to note for themselves the various methods of fertilisation.

Step IV. Formulation.—*Buds.*—Buds are either terminal or axillary. The bud is formed of hard scale-leaves which protect the tender leaves, which are folded round the growing point in several ways.

All the buds do not open together. If the earliest buds are nipped by frost, others open in their place.

In their earliest stages flower-buds and leaf-buds are identical.

Catkins.—A catkin is a collection of tiny flowers arranged on a stalk. The flowers are of two kinds—one bearing pollen, the other seeds. Before a seed will develop into a new plant it must be fertilised by pollen. The pollen is brought to it in various ways. It may be carried by insects or blown by the wind.

Step V. Application.—The children should be encouraged to make collections of buds and blossoms for themselves, examining each specimen in the manner shown in the lesson, and to compare and contrast each. The practical application made by farmer and gardener should also be pointed out. The farmer rolls the corn when it is beginning to sprout, thus causing the plant to tiller; while the gardener prunes his trees and bushes for the same reason, thus making them develop fruit spurs.

OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK.

TIBET.

TIBET, the "Forbidden Land," has for long ages attracted the attention of Western explorers, but its forbidding physical features, and still more the fanatical opposition of its inhabitants, have checked the ubiquitous white man. Lhassa, the capital, is a mysterious city, into which within the last hundred years only three white men have set foot. Several recent attempts have been of no avail. It is into this strange country that a British mission has recently advanced. The present objective is Gyangtse Jong, which is about 150 miles from Lhassa. Whether events will necessitate stronger measures, or an advance upon the sacred city itself, only time can tell.

The Country.—Tibet is an extensive and elevated plateau, the loftiest in the world, with an altitude varying from 10,000 to 15,000 feet. The total area of the country is about 651,000 square miles. The Kuenlun Mountains on the north and the Himalayas on the south enclose a surface of great plains furrowed by immense valleys and ravines, along which the upper courses of the Indus, Brahmaputra, Yang-tse-Kiang, Hoang-ho, and other rivers, descend to the adjacent lowland countries.

The climate is too cold to allow the cultivation of any but the hardiest cereals, although the pasture lands provide food for immense herds of sheep and goats. The chief native animal is the yak, or grunting ox. In a domesticated state this animal is of the greatest economic importance to the Tibetans. It is the beast of burden, especially in the highest altitudes; its flesh makes excellent beef; it yields rich milk and butter; and its long hair of silky texture is woven and spun into a variety of fabrics.

Exploration.—Probably the first European traveller to visit Tibet was Antonio d'Ardrada, a Portuguese Jesuit, who penetrated into the country in 1624; but he did not reach Lhassa. Forty years later other Jesuit fathers travelled from Pekin, passed through Lhassa, and thence to India. In 1708 a Capuchin mission entered the country, and for nearly half a century maintained peaceable relations with the natives. At later periods other Jesuits appear to have reached the sacred city, but only insignificant and untrustworthy records of the visits are in existence.

In 1811, the first and last Englishman visited Lhassa. This was Thomas Manning, a Cambridge man of Caius College, who possessed a perfect knowledge of the Chinese language. He stayed in the city for five months, during which time he had several interviews with the Dalai Lama. He published a narrative concerning his journey, but treated his subject with such eccentricity as to render it of little or no value. Nearly forty years elapsed before Huc and Gabet, two French priests, reached the mysterious city. Huc's account of his travels is a delightful book, but added little to our geographical knowledge of the regions he traversed.

In 1889–90, M. Bonvalot and Prince Henry of Orleans entered Tibet from the frontier of Siberia. They crossed the country, and eventually arrived at Tonquin, after a journey of nearly 4,000 miles.

Several years afterwards Walter Savage Landor penetrated where white man had never trod before. He was captured by the Tibetans, and endured a long series of punishments dreadful even to contemplate. Since then Sven Hedin, a famous Swedish explorer, passed into the "Forbidden Land" from Turkestan. He has added much to our knowledge of Central Asia and its peoples.

Our readers cannot do better than read the accounts of these modern explorers if they desire to absorb much geographical knowledge which has been gained under the fascination of the forbidden and the halo of the mysterious. Hitherto Tibet has usually been entered from the north or west. Our sketch map shows the route from India along which the British expedition will operate.

Chumbi Valley.—The British expedition has entered Tibetan territory *via* the Chumbi valley, which physically belongs to either Sikkim or Bhutan, but politically is a part of Tibet. In 1886 it was occupied by a British force; and as it may be considered the key to Tibet, it was a mistake not to have annexed it at that time. Passing from Sikkim, the route of the expedition lies over the Nathuila Pass (14,400 feet), from which a steep descent of 4,000 feet leads to Yatung, a small *bustea*, or assemblage of huts. This is the only village in Tibet on the side of India that Europeans are permitted to visit, a concession that was wrung from the Tibetans in 1886. At Yatung are the customs houses, where is checked the merchandise that crosses the Zeylapla Pass, the chief trade route between India and Tibet. A recent traveller says:—

"I stayed at Yatung for a week. Living is remarkably cheap there. A whole sheep, for instance, only costs three or four rupees, and the mutton is excellent. Curds derived from the yaks form the staple article of diet with the natives. Barley and buckwheat are the principal cultivated crops, though the former is grown only for the sake of the straw, which is used as fodder for the cattle in the winter. My presence was not altogether acceptable to the inhabitants: for although the Tibetans I met on the Sikkimese passes were all apparently friendly, invariably according me their orthodox salute—by lolling out the tongue, and scratching the lobe of one ear—in their own country they tried to intimidate me by curses and grimaces, and a certain night, when I was traversing a pine forest, I had some stones thrown at me. I think this enmity to Europeans is traceable to the religious fanaticism of the Lamas, who are afraid of the encroachments of the missionaries. Judging from those Tibetans who are residing in British territory, they are a very peaceful, law-abiding people, although exceedingly superstitious and uncleanly in their habits."

The Tibetans.—The people are a Mongolic race, well built and muscular, and more closely allied to the Burmese than to the Chinese. Buddhism was introduced into the country in the seventh century, and when it was almost expelled from the land where it originated,

it found a permanent home in the fastnesses of Tibet. The Tibetan clergy are numerous. Monasteries are found everywhere.

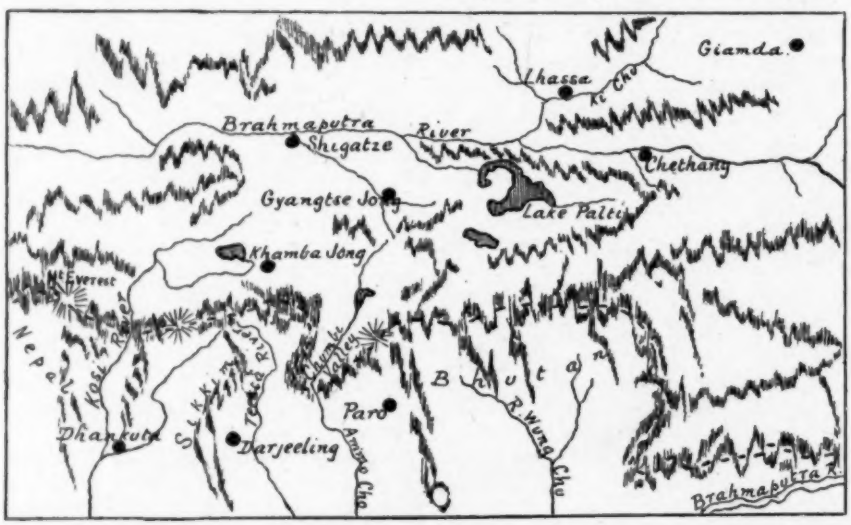
The actual form of Buddhism professed by the people is Lamaism, and at Lhassa is the abode of the Grand Lama, the incarnation of Buddha. The Grand Dalai Lama is chosen at about the age of five or six, and is kept in the sole charge of the "Gyalpo," or temporal chief, and is never visible to the outside world. When fifteen or sixteen the Dalai Lama dies of some mysterious disease. The Gyalpo thereupon announces that his spirit has passed into another infant, who has previously been selected, and the new Dalai Lama is invested in his high office with great pomp and weird ceremony.

The lamas—monks, as they would be called in Western regions—are gathered together in hundreds, and even thousands, in huge monasteries, or lamasseries. They own half the country, and constantly grow rich by usury and the legacies of the faithful. They are usually filthy in person, and though professedly celibate are notoriously profligate. Immune from taxation and labour, their ranks are constantly recruited from the more worthless and criminal of the population.

Government.—Nominally, Tibet is a province of China; but Pekin is 1,800 miles away, and the Chinese Government has little real influence. A certain amount of tribute is paid to the imperial suzerain, but the Emperor of China exercises little authority except the maintenance of two ambans, or residents, at Lhassa. These officials probably chiefly indicate the foreign policy, the main purpose of which is the rigorous exclusion of foreigners. The government consists of a council, in which are the two ambans, a prime minister, and nine councillors, five of whom are priests.

The present Dalai Lama is a man of such marked ability that he has maintained his high position, notwithstanding the fact that he is nearly thirty years of age. Very few Dalai Lamas have ever before lived to attain actual power, for it is to the interest of corrupt ministers to provide a succession of infant incarnations of Buddha.

The *raison d'être* of the Tibetan government is the preservation of Buddhism, and the policy of the closed door that was originally adopted with this end in view has become a vital principle of national preservation. The gradual absorption of vast areas in Central Asia



by Russia has doubtless accentuated the Tibetan resolve to keep Western civilisation at arm's-length. It says much for the efficacy of Russian methods of diplomacy that, in face of this feeling, Russia has recently concluded a secret agreement with the Tibetan government, and presents have been exchanged between the Czar and the Dalai Lama. The Russian gifts amounted to three hundred camel loads. The articles that afforded the Tibetans most satisfaction were rifles of American manufacture, for hitherto the only firearms in use were of the matchlock pattern.

The Tibetan army consists of about 4,000 men, armed with matchlock guns, lances, and bows and arrows; and even slings are not despised. Small garrisons are maintained at Lhassa, Shigatze, and Gyangtse, and the remainder of the forces are quartered in the villages near the borders. In the Sikkim campaign the Tibetan soldiers were made painfully aware of their deficiencies in equipment; but the Lamas play upon their superstitions, and induce them to rely upon divinations and spells to counteract the effect of modern munitions of war.

The Tibetans constantly mutter a universal prayer ("O the Jewel in the Lotus. Amen"), and to swell the number of their pious ejaculations they use prayer-machines. Little cylinders inscribed with the prayer are constantly twisted; and even the rivulets are utilised to turn still larger cylinders. Sometimes strips of woven material suitably inscribed are left to flutter in the wind, and every movement of the fabric is an invocation to the deity.

Among the poorer classes polyandry is common. The husbands of one wife are generally brothers. Polygamy is practised by the rich. The women, however poor, wear large quantities of jewellery, not infrequently solid gold. Large discs of silver set with turquoises are largely worn, but the stones are of poor quality. A kind of oatmeal porridge is the staple food; mutton is the chief meat. Butter is very largely consumed, huge lumps even being taken in tea. The bodies of the dead are generally exposed to birds and beasts of prey. A few of the rich are consigned to water, and sometimes fire, but the latter is rare.

The British Mission.—One of the chief causes of the present dispute is the appropriation of the rich grazing grounds on the southern declivities of the Zeylapla Pass by the Tibetans. In addition to the removal of this grievance, the Indian Government desires to further open up trade between the two regions; for the Tibetans have never generously interpreted the trading agreements concluded in the past. The British mission under Colonel Younghusband, which was dispatched to come to an amicable understanding with the Tibetan authorities, arrived at Khamba in July 1903. Negotiations were refused by the Tibetans, and the mission encamped to await the arrival of a flying column under Brigadier-General Macdonald.

Khamba is thirty miles beyond the borders of India, and is quite 14,000 feet above sea-level. On an isolated cliff is a fortified monastery, forming a stronghold second only to Shigatze. The village itself consists of about three hundred houses, with a population of a thousand. Every year in January thousands of sheep are slaughtered here. The carcasses are dried, and sold at from eight annas to a rupee each. Overlooking the valley, in the distance, are the snow-clad peaks of Kanchanjunga. The latest news is that the British expedition has retired to Sikkim. Shortly preparations will be completed, and the least result of the *émeute* will probably be the establishment of a British resident at Lhassa. At present cotton and woollen goods, metals, earthenware, matches, silk, and tobacco, to the value of £49,000, are imported into Tibet; the exports are chiefly wool and ponies, of about the same value.

Lhassa.—Lhassa is truly the most remarkable city in the world, if only that the little that is known of it has been so hardly won by an indifference to untold hardships and privations experienced by travellers who have entered its mysterious precincts. For anything like accurate descriptions of the city we are chiefly indebted to educated Asiatics. The following particulars are afforded by Ekai Kawaguchi, a Japanese, who went to Lhassa to complete his studies of Buddhist doctrines; and M. Tsybikov, a Russian Bouriat from the Trans-Baikal territory, who had studied Oriental languages in the schools of St. Petersburg.

The buildings of the city are chiefly of one and two stories. They are flat-roofed, and built of stone or sun-burnt brick. The population is about 70,000, of whom about one-third are priests. In the centre of the city is an immense temple containing a huge statue of Buddha, brought to Tibet about 640 A.D. Above all the buildings of the city rises the Bodalà, the palace of the Dalai Lama, surrounded by a collection of temples and monasteries. The royal residence is larger than the Vatican at Rome, and contains over 3,000 rooms.

The streets are never repaired, and are seldom cleaned, and as the habits of the people are extremely filthy, the state of the thoroughfares is better imagined than described. There are large numbers of Kams, Chinese, Kashmiris, and Mongols engaged in trade; but the Lamas themselves may be seen at roadside stalls selling merchandise, with their priestly robes rolled high up their arms.

On every side are met beggars who have lost their sight, been deprived of their hands, or suffered flogging and cauterisation, and other terrible punishments, for offences against the laws. A marked feature of life in Lhassa is, excluding the priests, the predominance of women, who enjoy almost complete independence in business and personal conduct.

It is perhaps a sign of the times that British goods are in constant request, and the Indian rupee competes with the national coinage. This may be but a foreshadowing of the breaking down of Tibetan aversion to Western civilization and progress.

THE INSPECTOR'S NOTEBOOK.

BY AN INSPECTOR OF SCHOOLS.

A TYPICAL RURAL SCHOOL, AND HOW TO CONDUCT IT.

HOW many of the rural schools have an average attendance of about 40! This is one of the most difficult of schools to manage, organise, and teach. I propose to devote the whole of this month's notes to helping the rural teacher, and they should be especially useful to schools of the size just stated. To begin with, for the advice of managers, let me unhesitatingly lay it down that a woman is to be preferred to a man for such mixed small schools. If asked why, I reply that more of the work to be done is suited to women than to men.

A Typical Rural School—Average 40.

About 14 of these 40 will be infants. If your room is over 18 feet wide and over 45 feet long, persuade your managers to put you up a wood and glass partition 16 feet from one end. You will then have a suitable place in which to enclose the infants. Otherwise there will be trouble in store from a disciplinary point of view. Inside the partition, moreover, it will be necessary to have an efficient assistant. Try to obtain an adult teacher who can leave the partition door open and help you occasionally with Standards I. and II. what time the Fours and Fives are disporting themselves with beads, bricks, wool, and the like. Otherwise, if your assistant be competent, and the classroom be sufficiently large, consign Standard I. entirely to her charge.

To sum up the staffing arrangements for our school, we must have:—

Headmistress and additional teacher, the latter preferably an Art. 50 or 68.

If Art. 50, arrange thus: Standards II. to VII., head; Infants and Standard I., assistant.

If only a paid monitress, as too frequently happens, then:—

Standards, head; Infants, monitress.

Before entering on the daily routine, let me emphasise the necessity of suitable desks. In many rural schools forms do duty for these in the infant class. The importance of having proper kindergarten desks cannot be overestimated in a school of this kind. Much of the routine has to be of a kindergarten nature, and flat-top desks for the bricks, tins, sand-trays, etc., are necessary.

Some Necessary Materials.

We will imagine our mistress has *carte blanche* from her Education Committee in the matter of materials, and proceed at once to advise her as to some of the many things one might reasonably call for. For the infants order plenty of kindergarten occupation materials—paper for paper-folding, beads for bead-threading, copies for crayoning and for embroidery, bricks for building. Order sticks or counters or seeds and a decimal ball-frame for teaching number, letters for reading, sand-trays for writing. As a luxury, you may be able to procure a rocking-horse or a swing.

Materials for the Standards. And now for the standards. Go in for everything in the way of time-saving apparatus.

You will need three blackboards and easels (one for the infants).

For arithmetic, procure sufficient books for every child to have one. You won't then have to waste time in writing sums on the blackboard. You should have a good pair of scales and a set of measures. Be careful to select arithmetic books containing plenty of problems. For reading, you know the required number of sets of books needed. Let your histories deal with general history; children have no time for detail. For geography you require an atlas for each upper standard child. In rural schools it is wise to have object-lesson readers, dealing with the course taken. There must be a globe, a map of the world, of Europe, of the British Isles, and of the county and district.

The Standards VI. and VII. scholars should have a dictionary each.

If you teach tonic sol-fa you will require song-books, one for each child.

The Time-table. We now come to the daily round. If a fair number of your children live a long way off (1½ to 3 miles, say), consider whether you hadn't better open at 9.30 a.m. You may take your religious instruction after the two hours' secular work, if you choose.

At whatever time you open, expect the children to be punctual. Keep a list of the late ones.

Have a separate time-table for the infants, with shorter lessons than for the standards. In drawing up your time-table try to distribute the time fairly over the whole of the curriculum—for example, needlework does not deserve five hours weekly; geography should have more than thirty minutes; drill must have at least one hour. The tendency is to give the elementary subjects too much time. Watch this especially on the infant time-table. Even in standard time-tables lessons are often too long. Two short lessons are generally more effective than one long one. Don't be afraid to alter your time-table when you find an alteration is for the good of the school. The school is not made for the time-table, but the time-table for the school. It is easy to notify the change in the log book. Generally, don't be afraid of experimenting.

Arithmetic should be taken daily, and should not be taken late in the day.

Singing should be taken for a few minutes daily. An object lesson should never exceed thirty minutes.

Organisation of the School. Organise the school in three groups:—Group I., Standards III. to VII.; Group II., Standards I. and II.; Group III., Infants.

In a school of this kind, especially when you have an indifferent assistant, study economy of labour by having the same course for as many standards, consistently with general efficiency, as possible. For example, take only two courses of object lessons. Throw Standard I. with the infants, and Standard II. with Group I., for this subject.

Use the same reading books for Standards III., IV., V. Let VI. and VII. do silent reading the while from an advanced reader.

For singing adopt the same division as for object lessons. I shall be glad to deal fully in these notes with any difficulties any rural teacher may care to submit to me by letter.

The "Notebook" Query Column.

All communications to be addressed "Inspector," care of Editor, 33 Paternoster Row, E.C. None but very urgent requests will be dealt with by letter. Two stamps for such replies should be enclosed.

S. F. M. desires advice respecting his course of study for a degree. His letter was prompted by my February notes.

Answer.—I take it your leanings are distinctly scientific, otherwise, as you are placed, I should counsel the B.A. course, as being less arduous and safer for private students. However, I think you would certainly be able to take your B.Sc. in 1906, providing you begin at once to read. Why not sink the L.C.P. for a time? That is my advice. Join a correspondence college, and, if possible, spend a month at a laboratory course. It is not easy to recommend you subjects. Everything almost depends on a man's natural bent. Why not write for the U.C.C. Guide to the Inter. B.Sc., and carefully read it? Don't delay. You will need all the time between now and 1906.

S. H. also seeks advice as to the L.L.A. She has not given her name. Correspondents must be good enough to do this, and to enclose the current coupon.

Answer.—It does not appear whether or no you propose to take up elementary teaching or to remain in the secondary branch. Please write to me again and give full particulars as to your aims. Your matriculation qualifies you as an assistant to earn about £50 in a primary school. There is a great demand at present for assistants (see the *Schoolmaster*). The B.Sc. is a large order, but is more valuable than L.L.A. However, the L.L.A. carries considerable weight. You would manage that well enough. Write to Registrar, St. Andrews University, Scotland. In any case I should like to hear from you again, and will advise more fully then.

M. G. S. asks whether the English certificate qualifies sufficiently for a Scotch post.

Answer.—I regret that my knowledge of the Scotch requirements is not very ample. Perhaps some reader can help us. Is a certificated teacher (England) so regarded across the Border?

I advise M. G. S. to write to the Secretary, Scotch Education Department, Dover House, Whitehall, S.W.

A. M. J. (Stratford).—Send me your full name and a coupon. I will then post reply.

PRACTICAL HELP IN THE ARITHMETIC LESSON.

BY GEORGE COLLAR, B.A., B.SC.,
Joint Author of "A New Arithmetic."

DIVISION may be regarded from two different points of view—*partition* and *quotition*. Partition consists in arranging a given quantity in a number of equal parts and determining the value of each part. Quotition consists in determining how many times one given quantity is contained in another. Thus the problem to divide 12s. into 3 equal parts is one of partition, while to find how many times 3s. is contained in 12s. is one of quotition. In both cases the usual custom is to speak of the answer as the "quotient," but strictly speaking this should be applied only in the latter case, because the first answer, 4s., does not show *how many times*. However, as the calculation neces-

sary to find the answer is the same in both cases, the two operations are often treated as identical, although they have a different object. In introducing the subject to children, it is better to treat the operation as one of partition. Concrete quantities involving only small numbers should be employed; and whether the class is following Scheme A or Scheme B, exercises in division should be given as soon as the multiplication tables have been learned. These can be given orally, and at first should involve only exact multiples—for example, Divide 20s. into 5 parts, divide 42d. into 7 parts; afterwards examples should be given in which there is a remainder. This will require the pupils to think of the nearest multiple below the given number—for example, Divide 23d. into 4 parts, divide 23s. into 7 parts. In such examples as these the teacher must insist on the remainder being given as a concrete quantity—namely, 3d., 2s. The remainder is not an abstract number, and by accepting 3 and 2 as the remainders the teacher is simply encouraging the children in loose and incorrect habits of thought. Another fact that the teacher must lay stress on is that the things in each part must be of the same kind as the things divided. If we divide 40s. into 5 parts, each part will contain 8 *shillings*. This is important, as leading up to the next step.

The first examples to be worked on paper should be such that there are no carrying figures—for example, 846s. ÷ 2—and from the first the place value of the digits should be insisted on. Thus the first step must be not 2 into 8, but 2 into 8 hundreds; and the result is not 4, but 4 hundreds; and the digit must be set in the hundreds' column—that is, under the 8. Similarly the next step is 2 into 4 tens, and the result must be set in the tens' place. If this point is rigidly insisted on, there will be absolutely nothing fresh to teach in division of decimals by whole numbers—for instance, in dividing ·0846 by 2 the pupil will naturally say 8 hundredths divided by 2 = 4 hundredths, and will set the 4 in the hundredths' place. This will be done by putting the 4 under the 8, and its place value will be made quite clear by writing the 0 and point to the left of it. We shall refer to this again later on, but mention it now to show the importance of requiring the children to recognise the place values from the beginning.

```
2 | 846
    423
```

```
2 | ·0846
  ·0423
```

Examples without carrying figures soon have to be abandoned, and more difficult ones taken in hand. Begin these with a low digit in the first place. Here teach that we cannot put any thousands into each part, as we have only 2 thousands, and there are 3 parts. Do not let the children put a dot under the 2. This is perfectly meaningless, and leads to confusion with the decimal point later on. The 2 thousands = 20 hundreds, making a total of 23 hundreds to divide by 3. The result is 7 hundreds, which must be set in the hundreds' place. The 2 hundreds remaining make 20 tens, giving a total of 24 tens, which when divided by 3 gives 8 tens; so that 8 must be set in the tens' place. The division of 9 completes the operation.

```
3 | 2349
    783
```

It will be seen that if the place value of the first digit of the result is recognised, the other digits fall into their places automatically: hence it is not necessary to refer to the values in the other steps so long as it is recognised in the first; but with beginners it is advisable to refer to it all through.

With a view to marking the value of the first digit, it is advisable to write the quotient of a long division sum *over* the dividend. If the first step were 73 thousand divided by 23, we can place the first figure 3 of the quotient over the thousands' digit 3 of the dividend. As we shall see later on, this practice enables us to indicate and appreciate the value of each digit in the quotient of a division of decimals as it is obtained, which is far more rational than the common practice of setting down a number of digits without having any idea of their meaning, and then resorting to a trick at the end "to put in the dot." For the sake of uniformity it would be as well to place the quotient over the dividend in short division, thus:—

```
 783
3 | 2349
```

We thus secure uniformity by making short division resemble long division. The reverse process is not so practical, because the remainders are generally so long that it is necessary to set them down.

In dealing with subtraction we strongly recommended that it should be treated as "complementary addition." One reason for this was that this view of subtraction enabled us to subtract the product of two numbers from a third number in one step. Before proceeding to teach long division, it is advisable to give a little time to practising such examples as 98 − 25 × 3. The point to notice is that it is unnecessary to obtain the full product before beginning to find the complement. Since 3 × 5 = 15, the number added to make a number ending in 8 must have been 3, and there must have been 1 carried, which added to 3 × 2 (or 6) makes 7. To this we must evidently add 2 to make 9. The mental working of a rather longer example is here given:—

73,258 − 8,465 × 8 = 5,538.

8 fives are 40, and **8** are 48; carry 4.
8 sixes are 48, and 4 are 52, and **3** are 55; carry 5.
8 fours are 32, and 5 are 37, and **5** are 42; carry 4.
8 eights are 64, and 4 are 68, and **5** are 73.

The heavy-type figures form the remainder.

Teachers who have been accustomed to waste time in writing down the product and making a separate operation of the subtraction are strongly advised to give themselves a little practice in this method of working, as they will find it a great saving of time in the end.

The next step consists in combining the steps dealt with above. This is best illustrated by an example:—

Divide 73,429 by 23.

The mental working is as follows:—

(*a*) 23 into 73 thousands = 3 thousand (set 3 in the thousands' place).
3 threes are 9, and **4** are 13; carry 1.
3 twos are 6, and 1 are 7.
(*b*) Bring down 4. 23 into 44, 1.

```
  3192
23)73429
    44
   212
    59
    13 rem.
```

(It is unnecessary to go through the form of multiplying by 1.)

3 and **1** are 4; 2 and **2** are 4.
(*c*) Bring down 2. 23 into 212, 9.
9 threes are 27, and **5** are 32; carry 3.
9 twos are 18, and 3 are 21.
(*d*) 23 into 59, 2.
Twice 3 are 6, and **3** are 9.
Twice 2 are 4, and **1** are 5.

The following general remarks will be useful in teaching division:—

1. Never allow the use of the sign + to mark off a remainder. The answer to the above sum is not 3,192 + 13, because 3,192 + 13 = 3,205, which is not the answer. Use a comma after the quotient, and indicate the remainder by r. or rem. Thus 3,192, rem. 13.

2. Remember that the chief difficulty that children experience lies in the estimation of the number of times the divisor is contained in each dividend. This difficulty is much increased by carrying figures when the digits on the right of the divisor are large. Hence in arranging a graduated course of examples, begin with such divisors as 21, 31, 41; 91 is an easier divisor than 19.

3. Point out to the children that such numbers as 39 and 59 are nearly 40 and 60 respectively; hence they will be contained about as many times as 40 or 60, which may be used in estimating the digit to set in the quotient.

4. The remainder at any step must always be less than the divisor. If the digit set in the quotient is not sufficiently high, this will be the case, and instead of multiplying all over again the correction is best made as follows:—

```
      9
    3182
23)73429
     44
     212
      28
      59
rem. 13
```

Suppose that in our example we found 28 in the remainder after setting 8 in the quotient, it is evident that instead of subtracting 8 twenty-threes, we should have taken away one more of them. Hence we alter 8 into 9 and subtract 23 from 28, and this will give us the correct remainder, and with this we continue the working.

A COMPLETE SCHOOL COURSE OF ELEMENTARY GEOMETRY.

3. *Parallels and Perpendiculars. Use of Set-Squares.*

Parallel lines to be regarded as lines having the same direction in any plane, but not coincident. Illustrations from edges of paper, desks, sides of blackboard, window sashes, etc.

(*a*) To draw parallel lines by means of set-square.

Place ruler in position, and lay set-square along it as in Fig. 1.

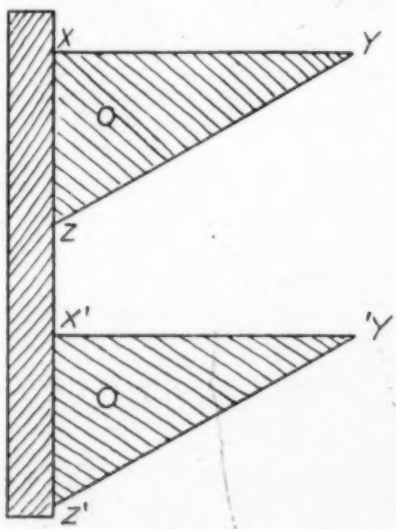


Fig. 1.

Draw line XY. Keeping ruler fixed, slide set-square into lower position, and draw line X^1Y^1. Repeat, this time drawing lines ZY and Z^1Y^1.

Practise drawing parallels with straight-edge and set-squares in various positions, keeping constantly in view the idea of sameness of direction.

Draw, by means of ruler alone, any two lines as nearly as possible parallel. Test their parallelism by means of set-square as above.

(*b*) To draw perpendiculars. (Explain term.)

In using set-squares it should be remembered that the angles at the vertices are difficult to draw accurately, hence considerable care is required in their use.

Draw any line XY. (Fig. 2.) In it mark any point Z. If set-square be placed as in (*a*), an inaccurate result is most probable. If used as at (*b*), a correct result is easily obtained. First place below XY, then slide up.

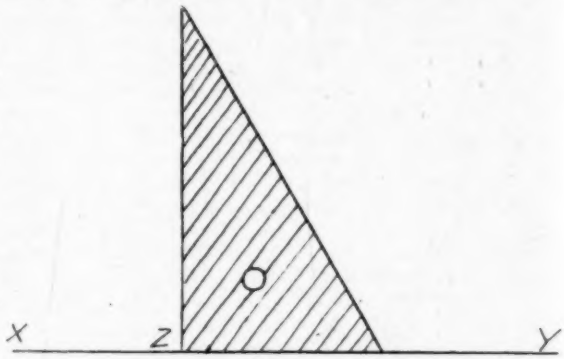


Fig. 2a.

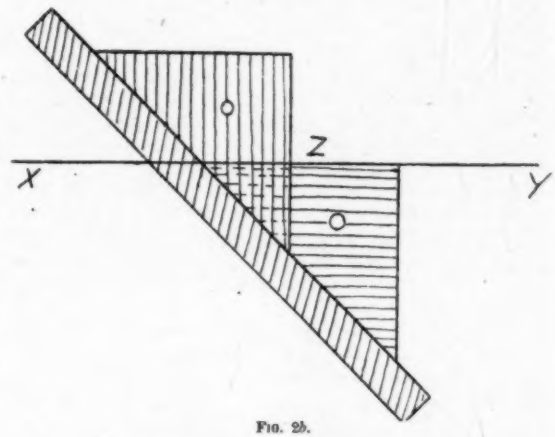


Fig. 2b.

When point is not in XY. (Fig. 3.) First place one set-square as in figure parallel to XY. Then slide the other along, until its edge is just clear of Z, and draw the line required.

A great deal of practice similar to the above is required before facility in the use of set-squares is obtainable.

(*c*) Further exercises with parallels.

Draw any two parallel straight lines. Draw a third line to cut both. (Fig. 4.)

Explain that EH is called a transversal, and why.

Measure angles 1-8, 2-7, 4-5, 3-6, 5-7, 6-8, 6-7, 5-8. Tabulate results.

Note that of the eight angles formed by the transversal, four are within the parallel lines, and are called interior angles (5, 6, 7, 8), while four are without, and are called exterior angles (1, 2, 3, 4).

Note that the difference between the directions EX and XB is exactly the same as the difference between XY and YD, hence the angles 2 and 7 are equal. These are called corresponding angles. Find the other corresponding angles.

Draw any two parallel straight lines, and two parallel transversals. (Fig. 5.)

Explain that the portion of surface enclosed by ABCD is called a parallelogram. Obtain a definition of parallelogram. Measure the four sides and the four angles. Enter results.

Make the transversals perpendiculars. (Fig. 5*a*.) Obtain the difference between this figure and the last. Indicate it by particular name—rectangle.

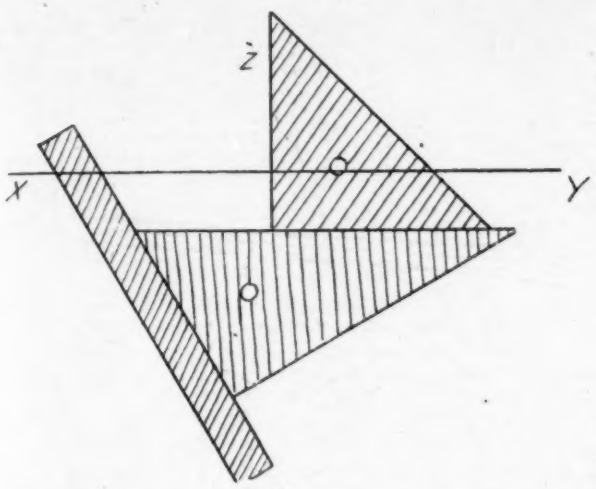


FIG. 3.

Draw any line AB. (Fig. 6.) At A draw perpendicular AC. Make AC = AB. Through B and C draw parallels to AC, AB.

Repeat, but draw AC this time at any angle to AB. (Fig. 7.)

Note differences between these figures and the first two, and give names—square and rhombus.

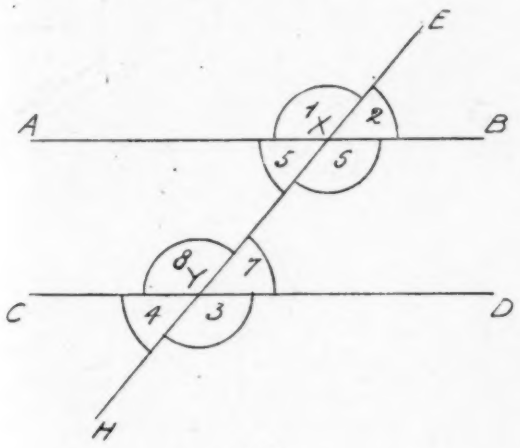


FIG. 4.

Draw the two diagonals in each figure. (Explain term.) Measure them as a whole. Measure their parts. Enter results.

By means of ruler and set-square draw four parallel lines half an inch apart. (Fig. 8.) Draw from A any other transversal. Measure parts *a*, *b*, *c*, *d*. Note result. Use same method for division of a line into any number of equal parts. Extend this to the division of a line in any proportion.

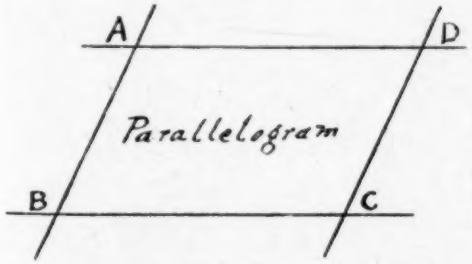


FIG. 5.

The following constructions are indicated briefly: -

4. *Triangles.*

Construction of triangles with three given sides.

Measurement of the three angles by means of protractor, and proof of result by considering rotation of a line.

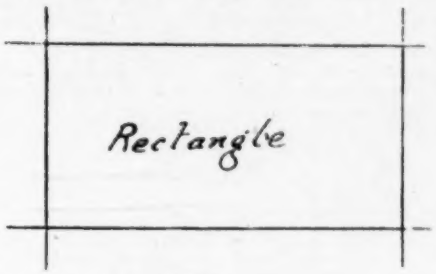


FIG. 5a.

Construction of special triangles, and explanation of terms required—

(*a*) Equilateral, isosceles, and scalene, according to nature of sides.

(*b*) Right-angled, obtuse-angled, and acute-angled, according to angles.

Measurement of angles and sides, noting relations carefully.

Construction of pairs of triangles having three parts in one equal to three corresponding parts in the other. Measurement of remaining parts, and entry of results in note-book.

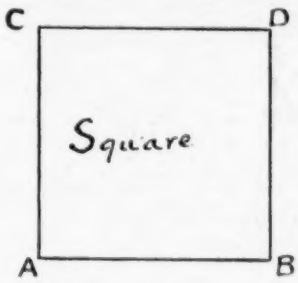


FIG. 6.

Construction of similar triangles, by drawing any triangle, and by means of set-square drawing a line parallel to one of the sides. Measurement of angles and relative lengths of sides.

5. *Measurement of Areas. Squared Paper Exercises.*

Construction of parallelograms on same base or equal bases and between same parallels.

Construction of triangles on same base or equal bases and between same parallels.

Construction of rectangle and measurement of area.

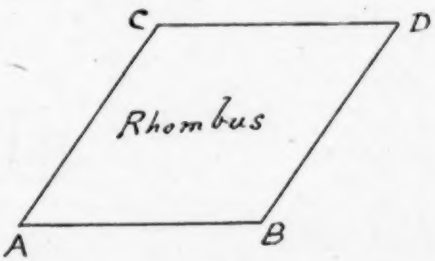


FIG. 7.

Construction of rectangle and triangle on same base or equal bases and measurement of areas.

Construction of squares on sides of right-angled triangle and measurement of areas.

Enter all results in note-book.

6. *Some Simple Constructions, involving Ruler and Compass alone.*

Bisection of an angle.

Bisection of a line.

Construction of an angle equal to a given angle.

Construction of perpendicular to a line either from point within or without.

7. *The Circle.*

Find centre of a given circle by drawing two chords, and lines at right angles to their middle points; hence draw circle to pass through three points.

Draw equal chords in a circle. Measure the distances from centre.

Take any segment, join extremities of chord to various points in circumference. Measure angles formed. Particularise for semicircle and for segments greater or less than a semicircle.

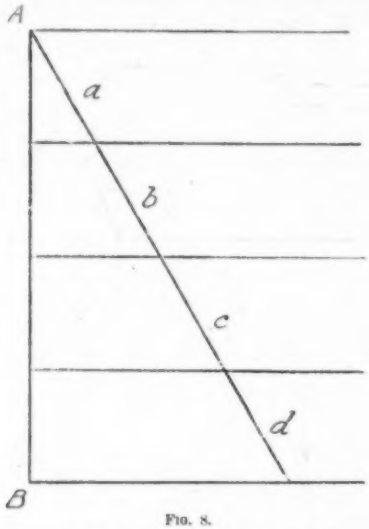


FIG. 8.

Draw any quadrilateral in a circle. Measure opposite angles.

Take any radius, and draw a line at right angles to its extremity in the circumference. Produce this line and obtain its property. Explain term tangent. From property of angle in semicircle show how to draw two tangents from external point to a circle. Measure these, and the angles formed by each tangent, and the line joining centre to external point.

Enter all results in note-book.

NATURE NOTES FOR THE MONTH.

BY P. HORN.

Leaf-Buds.

THIS month sees the practical field naturalist overhauling his collecting-boxes and other apparatus, in pleasurable anticipation of the season of serious outdoor work, which is just now beginning. The "dead season" over, a general awakening takes place among Nature's children: vegetation begins to reassert itself, birds sing, and even the veteran naturalist feels a thrill as he conjures up pictures of the good time coming, when vasculum and killing-bottle can again be used after their compulsory winter rest.

The leaf-buds should soon be bursting on some of the trees, and the casual observer who notices them for the first time will be surprised to hear that these self-same buds were formed last year whilst the leaves were actually on the trees. Buds usually make their appearance in the armpit angle between the leaf and the twig, and in the case of the plane the old leaf-stalk completely covers the embryo bud. Neatly packed into the smallest compass, the tiny bundles of undeveloped leaves have been in existence all the winter, and they only require the influence of a few mild days to make them burst their protective covering. This covering, made up of a number of comparatively hard, overlapping scales, is sometimes lined with warm down, and in the case of the horse-chestnut it is rendered additionally protective by a waterproof covering of resinous gum. When the leaves gain a little headway, the coverings, no longer required, drop off in pieces, and under budding beeches and limes quite a layer of red-tinted scales may be seen.

Tree Flowers and Catkins.

A great many of our British trees (lime and sycamore furnish good exceptions) bear their flowers some weeks before the appearance of the leaves, and very queer flowers they are, too, in some cases.

The familiar "palm," which the children will shortly be seeing in the churches, bears no relation to its Eastern namesake; it is merely a home-grown substitute, cut from the willow bushes or "sallows." The furry silver knobs which make the palm look so beautiful are clusters of male or staminal flowers, which if left on the tree would shortly become covered with pollen dust, the fertilising medium which is essential to the production of seeds.

The female flowers have not the woolly appearance of the males, nor do they grow on the same plant; so at first sight it might appear that their mission in life would be left unfulfilled.

However, Nature provides two pollen distributing agents—the March winds and the honey-loving insects. Both wind and insects have easy access to the flowers, because the latter (the flowers) invariably appear before the leaves. As to the insects, the few there are about will be sure to make a round of the bushes incidentally or accidentally bearing pollen, and the entomologist who is aware of the fact gets many an early moth by "working the sallows." After fertilisation, the ovaries increase in size, and ultimately split at the tips, discharging a multitude of fluffy seeds.

In the woody copses a few hazel flowers of both sexes may still be found, growing on the same bush, and exhibiting very marked differences. Flick one of the long limp catkins which hang so conspicuously, and see how the yellow pollen dust flies: the whole catkin is simply a colony of tiny male flowers clustered round a central stem.

Look along the same branch, and see if any of the buds show a bursting tip with a protruding red tuft. These are the scaly-clad clusters of female flowers, some of which will ultimately produce the nuts later on if all goes well. Other trees bear catkins. The alder, birch, poplar, and willow, all can be found in March.

Wild flowers are not very plentiful at present, so perhaps that is the reason why the primrose, snowdrop, and violet are thought so much of when they appear. The coltsfoot is now sprouting and sending up a long stem, clothed with coarse scales and tipped with a yellow-brown flower something like a dandelion. The large round leaves, which have a woolly, flannel-like surface, will appear later, when the flower is done.

Pioneer Insects.

On mild days the scanty sunshine will wake up our hibernating insect friends, and our eyes will again be gladdened by solitary bluebottles and dancing parties of gnats. The advent of the leaves is the signal for a devouring army of caterpillars to issue forth.

Some, half-grown, have been sleeping beneath the grass roots and in bark crevices; others are mere infants, newly emerged from the shells of the eggs which were deposited last autumn.

Their one object in life is to eat, and they will do this to such good purpose that in three months' time we shall find them completely metamorphosed into perfect insects—moths or butterflies capable of laying eggs for the development of future hordes.

Along the dry banks we may occasionally come across a large solitary wasp or bumblebee, who seems to be occupied in exploring the rat holes. The insect is a queen (fertilised last autumn), and she is looking for a hole in which to found one of the colonies whose inhabitants pester us in the autumn.

A queen wasp in spring is equivalent to several thousands in late summer; and knowing this, the farmers in some parts put a price of a halfpenny on the head of the unfortunate March wasp, to the delight of the small boy, who sometimes plays truant and earns a respectable sum.

Reappearance of the Reptiles.

For three months, dating from the 15th inst., the fresh-water coarse fish (fish other than salmon and trout) are protected by law from the wiles of the angler. No true sportsman would attempt to catch them, for they are depositing their eggs.

Toads, snakes, slow-worms, and other reptiles now crawl forth from their winter holes, after a refreshing little sleep of four months' duration. They went to bed as plump, clean-skinned creatures; they now issue out, looking as if a good meal and a new suit would benefit them.

During the hibernating period the reptile subsists on a store of internal fat, the produce of sundry good meals. Hence we see that a weakly or maimed individual, precluded from catching prey in the preceding summer, has no reserve store of fat to rely on, so it goes to sleep with very little chance of ever awakening again. This is one of Nature's methods of weeding out the sickly, a case of the survival of the fittest—or rather, in this case, the fattest.

The common tortoise, a strict vegetarian, who has been placed in the garden with the mistaken idea that he will eat the slugs, now crawls out from under the rubbish heap, to see if the gardener has planted any choice plants for him to nibble.

The Song of the Toad.

Early in March the frogs and toads make their way to the nearest ponds and streams for the purpose of spawning, and the monotonous croak of the latter animal can be heard even in the daytime.

I noticed last year (the 3rd of March, to be precise) that the frogs of a certain meadow were unanimous in choosing a particular part of the stream for a breeding-ground, and a spot of a few yards square was subsequently covered with spawn. I expect the stream was gentle at this particular point.

When first deposited, the eggs of the frog lie at the bottom, but they soon swell by absorption, and becoming lighter, bulk for bulk, float on the surface in an irregular mass, considerably larger than the body of the parent. The whole mass has the appearance of a whitish jelly, heavily speckled throughout with tiny black spots, the latter being the true egg which contains the embryo tadpole.

Originally deposited singly, the massing together is the result of the cementing of the globular protecting envelope which surrounds each individual germ. Toad spawn is similar, but differs by being deposited in long double strings.

Take some frog's spawn, and drop it into an aquarium to watch developments. Before doing this, separate a tablespoonful from the main body, and put it into a vessel containing 5 per cent. formaline and 95 per cent. water mixed. It will be useful for future reference, especially if you add the tadpoles taken at different periods from your aquarium. April is the true tadpole month, and I will then describe how and when to execute your captives, so as to form a neat little series illustrating the life history of the frog.

How the Birds go Courting.

The resident birds, reminded by the occasional bursts of mild weather that spring is at hand, begin to look about them for a suitable mate to share the joys and sorrows of housekeeping. To attract the attention of the females, the males perform many curious antics, ridiculous enough in our eyes, but evidently pleasing to those for whom they are intended. The blackbird's wooing, with its characteristic "procession of two," is well worth watching, and the demeanours of the sexes strike the cynical observer as being intensely human.

The leading bird, a dingy brown female, is so engrossed in worm gathering that she is apparently oblivious to the presence of a black-coated admirer who has been following her for some time. To inform her of his presence, and incidentally to show off his well-groomed plumage, he salutes her with a soft cluck, accompanied by a corresponding jerk of his drooping wings and elevated spread tail. His whole attitude, masterful yet respectful, creates a good impression on the hen bird; but she is far too wise to show any appreciation of his good looks. She prefers to keep him in suspense a little longer, so she hops off with her suitor trailing obediently behind, ready to repeat the performance at the next stopping-place. This little comedy continues until the lady begins to see what a devoted husband this persevering fellow would make, and at the end of the month the same pair may be seen carrying grass roots, or dabbling for mud, to make a foundation for a nest in the neighbouring hedge.

The wood-pigeon behaves in a very stately and dignified manner. Inflating his chest and spreading his tail, he makes a graceful bow to his partner, following her up with a curious lumbering hop, totally unlike the usual pigeon walk. On coming to a mutual agreement, they repair to a neighbouring tree, and sit side by side preening each other's feathers. Now and again the male sails off and mounts upwards toward the sky, clashing his wings above his back. On reaching the zenith of his flight, he stops momentarily and glides downward on outstretched stationary wings, making a beautiful curve, the impetus gained being utilised in another upward flight. Should another male appear, a battle in mid-air takes place, accompanied by a great clashing of wings and shedding of white body feathers.

The Birds' Spring Fashions.

Many birds, finches in particular, undergo slight changes of plumage coincident with the return of the sexual passions, which have been lying dormant all the winter. These changes, not to be confused with the autumn moult, which is a shedding of the *whole* feather, are brought about by the disappearance of certain

feather *tips*, resulting in a general smartening up of the bird's plumage. A good illustration is afforded by the starling, a bird whose familiar habit of frequenting houses renders him easy of observation. During the winter his blackish coat, heavily speckled with gray-brown, does not strike one as being particularly stylish. But note the change which takes place when the bird begins to look about for a mate. The brown beak turns yellow, the dusky feather-tips disappear, and the plumage, which now appears black at a distance, is seen, on closer acquaintance, to be shot with glistening metallic tints of purple and green—truly a combination of colour which should appeal to the heart of the spinster starling.

The male chaffinch, one of the neatest of our hedge birds, is looking additionally smart now that the characteristic rusty tips of winter have worn off of his steel-blue crown. His beak, too, is rapidly getting blue, and his white wing-bars seem more conspicuous as he flicks along the hedge with his familiar "pink-pink." His newly-acquired finery excites the envy of all his male acquaintances, and fierce are the fights which take place when he meets any of his former winter cronies. In defiance of the Wild Birds Protection Act, bird-catchers take advantage of his pugnacity by mounting a stuffed effigy of one of his defunct companions in a conspicuous place. A moment's reflection would tell Mr. Chaffinch that the wretched object is a fraud; but, excited by the notes of a hidden call-bird, he dashes down to give battle, and speedily finds himself entangled in cunningly-placed limed twigs.

The Survival of the Fittest.

This spirit of contention, which is common to all birds during the breeding season, brings forcibly to our minds the wisdom of one of Nature's unwritten laws—that of the "survival of the fittest." The males predominating, it stands to reason that only the strongest and best-developed birds can secure mates; the weaker individuals, being hustled out into a compulsory state of single blessedness, have no chance of transmitting their poor physique to a future generation. The stronger birds appropriate the best nesting-places, and by virtue of their superior physical powers are able to defend their homes, and also to keep the larder well supplied, so that the lusty young ("like father like son"), reared under these favourable conditions, have every opportunity of building up bone and muscle to hand down to *their* offspring in years to come.

Quietly but surely the same ceaseless struggle is going on in the vegetable world, the stronger plants crowding out their weaker brethren and appropriating their nourishment, thus ensuring a more limited supply, but an individually stronger stock.

Why does the farmer weed out his lettuces in the kitchen garden? Simply so that the stronger plants shall have more nourishment, and not spend any of their strength in crowding out the weaker.

Early Nests.

Nesting operations will begin this month, and the nests and eggs of the following are the first to appear—long-tailed tit, thrush, missel-thrush, blackbird, and hedge-sparrow.

One of the prettiest of our nests is that of the long-tailed tit. It is an oval, dome-shaped structure of interwoven moss and cobwebs, with the entrance hole at the side and near the top. The exterior is ornamented with flakes of silvery lichen. Nor does the little architect neglect the interior, which is packed with the softest feathers. The builder, a quaint gray-headed little fellow of restless habits, is easily recognised by his tail, which is twice the length of his body. It is quite a common occurrence for the female to lay eight or ten eggs, and when she leaves them to search for food she carefully closes the front door by pulling a feather over the hole.

The robins are roaming the banks and hedge-bottoms, searching for an eligible building site suitable for a private family. The nest is built in a hole, and is by no means easy to find, owing to the friendly shelter of overhanging vegetation.

An old kettle is not despised by Mrs. Robin, for, furnished with dead leaves and horse-hair, it makes an admirable rainproof shelter for the children.

Bird-Nesting and its Remedy.

Thrushes are now nesting, and the male often betrays the whereabouts of his treasures by persistently singing from a favourite perch. He chooses a particular tree in the vicinity of the nest, and his presence there, day after day, often on the same branch, informs the bird-nester that there is a thrush's nest in the hedge beneath; consequently we find that thrushes' eggs figure largely in the boy's "collection." A string of forty thrushes' eggs is undoubtedly pretty, but what is its interest compared with a dozen, each from a different bird? Boys will collect in spite of the law, and it is a pity that they do not go about the business in a scientific manner. There is no particular harm in having a school collection, provided that *variety* rather than *numbers* is insisted on; in fact, a good series, illustrated by dates, locality, species of bird, etc., will prove a storehouse of information to the child, whose inquisitive mind is always on the alert for something new.

I believe it would be actually possible to institute a school nest-finding club, provided that the teacher was a practical naturalist, who could direct the boys' thoughts into the proper channel. The harm done is entirely due to ignorance. Excite the boy's interest, teach him something about the birds, and perhaps he will look upon them with a more friendly feeling.

Pheasant-rearing incidentally conduces to the preservation of many of our rarer birds. Keepers strongly object to having their coverts disturbed at this time of the year, for the newly-mated pheasant, with his half-dozen wives, is apt to fly off and breed on a neighbouring estate; so the trespasser and bird-nester, and even the innocent botanist, is suppressed with a firm hand.

Departures and Arrivals.

The tide of migration is now flowing strongly toward the north. Bramble-finches, plovers, fieldfares, etc., all are moving steadily in a north-easterly direction, impelled by the universal desire to reach their breeding haunts. The birds living in the south of England do not make one journey of the whole distance—that would be far too fatiguing—so they endeavour to attain their end by a series of marches, a day here, the next farther on, and so on until the coast is reached. Then the real journey begins, and the birds no doubt feel thankful that they have husbanded their strength.

The coast of Norfolk seems a favourite place for both migrants and birds of passage. A glance at the map will show that its natural situation makes it a convenient landing-stage for travellers from North Europe.

The Practical Infant-School Teacher.

OUR MODEL INFANTS' SCHOOLS.

XX.

THE entrance to this highly-successful school is perhaps unique. About half-way down a narrow and busy thoroughfare, where costers' barrows pretty thickly line the street in rows near the pavement, and fully-flavoured oranges and onions and fish pervade the already overcharged air, you come to COURT 16. You wouldn't think there was a school near, because you cannot see one; but go down the court a little way, then turn to the left and pass three open doors of wash-houses, where women are hard at work, and babies tied in chairs are screaming as lustily as lungs of their size can, and you come to a sudden unfolding of space.

That is the playground of St. A's School. The school rises high in front of you, and on the borders of the playground huge factories tower in the air. Their chimneys belch forth black smoke, and the din of the machinery and the whirring noise of the fly-wheels make one very much depressed when on an errand of such a nature as this—interviewing.

Once inside this sunless school and the influences from without are forgotten.

Two hundred children have assembled, notwithstanding the fact that the morning is cold and foggy. They have come along several crowded thoroughfares, and through the aforementioned court. Yes, this is the only way by which young and old may enter the school.

Gas-jets—twelve of them, attached to two long pipes hanging from the roof—light up the space (40 feet by 20 feet), and show shock-headed children and prim teachers and mistress, all hard at work like the washerwomen outside, but in a different sphere. There is a hum of business—that is from the children; there is brisk movement—the teachers'; and there is peaceful calm—that surrounds the mistress as a halo does the moon. She is seated at the desk entering up attendances. Names have been called, and the numbers are now ready for the inspection of any who might officially or otherwise call and ask for them. She expects the visitor, and seems glad he has come and escaped the perils of the journey. A moment or so ago he was really anxious as to his sanity; for what a peculiar set of people the managers must have been to have dumped down a school in such a place. The explanation, however, is clear. The factories have come to the school, and not the school to the factories. The entrance years ago was over a wide space of unused land.

The position of the school has been dwelt upon for the purpose of impressing on the reader that in our profession, more perhaps than in any other, it does not matter so much *where* the work is, but *what* it is. Good work can be done anywhere, and is being done under very trying circumstances, because the heart that directs is at work as well as the head.

The Scripture for the day is over, and the children are now being taught a few elementary notions in arithmetic—orally, with the aid of the blackboard. From the desk all classes can be seen, and they are engaged in similar exercises. Yes, even those in the classroom behind the desk are calculating, but there simultaneously in table form. It is the only half-hour they will enjoy in a separate room during the morning; for all classes in their turn will visit the one solitary place in the building where work of that nature can be done without interfering with that of another class or group. A fair arrangement!

If I enjoy one thing more than another when taking stock of an unfamiliar school, it is to see the blackboard freely used by the children themselves. There is nothing like it for incisive and stimulating and successful teaching. The cramped figures and crooked lines made by tiny hands can be passed by as of no moment. That which is beneficial is the fact that the operator is more closely allied to his work than if he were at his slate; he is more closely watched and criticised than if the teacher herself were "figuring." If a child can be induced to *talk* his operations loud enough to be heard by his classmates—and this can be achieved by the child's being accustomed to do so—so much the better; for, as looking and listening go hand in hand to make correct attention, anything which tends to produce these two desirable habits is worth aiming for. Children's blackboard work is a means to this end. Let the children become blackboard workers as readily as they become reading-book readers. Why not?

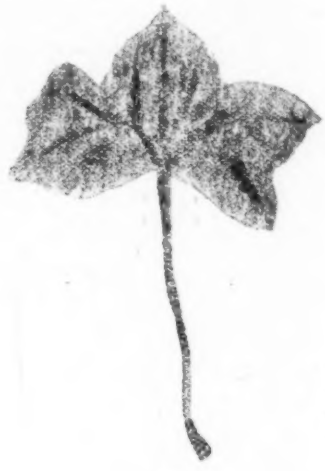
During a lesson of half an hour the board nearest the mistress's desk has been lowered several times to enable more and more exercises to be written on it. Now it is practically full of tiny, scrawling, simple, and useful pieces of work. Seven children have each done a little to make the instruction of thirty as profitable as possible. By means of a short division sum ($30 \div 7$) it will be seen that the exercises of each were pretty rapid. This is part of the value of blackboard work. The oral instruction interpolated by the teacher during the child's activity—or better still, between that of each and the next—is the other part.

Scheme B is the course of arithmetic adopted in the two senior schools attached to this, and by mutual arrangement the infants are well grounded in the elementary notions to prepare them for their future tasks. More blackboard and oral work is done dur-

ing the first half of the year than slate work; but during the second half, when work must be expressed for examination as well as known, slate work is the rule. This arrangement pays, for what is in the head

Mistletoe.

Bay Leaf.



Ivy.

will flow out at the tip of a pencil if it be required. Every one with experience knows this to be the truth. A movement onwards is being projected, and by the aid of the New Education Authority it will be carried out—that is, slates are going to be discarded at the end of the present school year, July.

Notice of time to change lessons is given by the sound of a desk-gong. The moment it goes everybody

Carnation Buds.

Primula.

Currant in Winter.

stops, no matter what is being done. This is necessary for the convenience and comfort of all. One of the classes has to go into the classroom, and that in has to come out. The marching to and fro is expeditiously carried out, and the children accentuate the step by bringing the left foot heavily to the floor. The floor is a veritable sounding-board, but not very musical. Attention cannot always be paid to marching when there is little or no space in which to practise it. And this is the case here.

Preparations are being made just at this moment for a special lesson in one of the subjects for which the school, although a poor one, has become famous; nor does it take long to carry them out. The special lesson is nature drawing. From the school's surround-

ings no one would think that nature study would stand a ghost of a chance. But it does. The mistress lives in the country—a sensible woman—and she comes

into town each day by train. She has a garden, and from it on drawing days she brings a handful or so of suitable specimens as will serve for drawing copies. This morning's specimens are very plentiful, and they comprise easy forms. These are some of them—a spray of leafless rose, showing seed-pods and premature spring shoots; a last year's carnation flower-stalk, which has till now weathered the wintry storms; a leaf of a rhododendron, fleshy and of perfect form; a twig of withered mistletoe; a primula leaf; and a leaf of ivy with a long stem. The specimens are distributed as far as they will go, one between two children, and laid flat on the desks. The pencils used are black chalk—carbon pencils, thick to hold, and easily rubbed on the paper. Form, regardless of line, is sought for at this period of the year, which is six months on. The drawings look of the rough-and-ready sort, but the forms are very good indeed, and the proportion excellent. The speed of the work is remarkable; for in half an hour several of the children have exchanged specimens, and in some cases have "managed" two or three copies. The work of last year's children—six-year-olds; there is no standard class—shows up well in frames, straw frames made by the teachers, on the school walls; and as the course extended through the summer months, the copies are of an endless variety. All are simple but useful for teaching "form."

In connection with this subject there is an attempt at correlation; but, as may easily be imagined, considering the special difficulties of the school, not to a great extent. Better little than none. Better still, just enough. This morning, at the close of the drawing lesson, a chat or a kind of discussion was conducted by the mistress herself on the specimen of carnation stalks and buds. This was selected so that the children might have the opportunity of expressing their powers of observation and memory. They remembered having had a splendid bunch of yellow carnations as far back as last July; and now they are shown, in the depth of winter, all that is left of a similar flower. What has caused the withering, the breaking of the stems and leaves, the destruction of the pod, the whole change? Rain, snow, frost, wind, and all the things that go towards making the season of winter so much felt. The description of the bursting into life of the same plant in the course of a month or so, and the method of renewing the species, told in story form by the mistress, awakened an interest in the specimen, and brought in some of the natural differences between the seasons.

Dried specimens of leaves and flowers have been cleverly arranged on cards, so that, if it be desired, the children can use them at any season of the year. The mistress prefers, however, to have freshly-gathered specimens for each lesson. Infant minds, says she, are weary of the old copies. The wonder is that kindergarten aids are so enjoyably used from time to time.

The class we visit now, and which, indeed, we have from time to time glanced at during the progress of the lesson just described, is finishing a writing exercise. It is a class of children who are grouped together as exceptions—exceptionally dull, newly-admitted and knowing nothing, and every other feature, in fact, which points to a child below the normal. The fingers of nearly all of them are weak and uncontrollable. You should see the writing of some of them—or rather what should be writing. It is indescribable. That's very certain. But something must be done. There is the future to consider, and one day these must find a place in a higher class. The teacher is very patient. She knows she has uphill work to do, and she climbs very, very slowly. In this she is encouraged by two things—the sympathetic help of the mistress, and the steady progress the children make. From the cupboard, where it has been kept with care for some eight months, was brought out a slate, on which were marks, supposed to be writing, just visible. It was the first attempt of a brave little girl who now writes beautifully, and is promoted two removes. The system adopted may be expressed in three words all the same—practise, practise, practise. This involves writing in large quantities at a time. With a small class, and close and energetic supervision, the system is an admirable one. The children learn quickly, and the knowledge that they are making progress is stimulating to them. Except for little talks on easy subjects, and a story now and then as occasion crops up, all the lessons in this class are devoted to the three R's. What has been said as regards the teaching of writing may also be said of the reading. Page after page is read, revised, written on the blackboard in short pieces, and read and revised again. All this both morning and afternoon. A special and separate time-table is necessary for this class.

In the upper schools the children have the advantage of belonging to several school institutions, and to one of these the infants may be attached, due regard being paid to fitness. It is a Guild of Kindness. Kindness as a virtue is encouraged. If a kind action, no matter how trivial, is witnessed by a teacher, or reported by a scholar or neighbour, the doer is complimented and rewarded by a badge of the guild. The possession of the badge carries with it membership. The member is duly received at a weekly meeting, and henceforward can enjoy the privileges of the other members. Three houses in the court are rented by the managers of the school. They adjoin each other. In the centre one lives the caretaker; those on either side of his are used by the guild, one by the boys and the other by the girls. They are both fairly well furnished, and play the part of club-houses to the school. The boys' has a bagatelle table, draught-boards, and other means for providing indoor recreation, and several newspapers and magazines. These have been provided by the vicar and the parishioners. The boys are taught some kind of craft, and on the walls of the rooms may be seen leatherette workings, such as frames or ornaments, carvings, and fret-saw work. There is a lathe too, but this has not been in active service for some time. Young men attached to the church render valuable help during the evenings, and much benefit comes to the boys who are able to attend with anything like regularity. The girls' section is worked on a similar plan, but the character of the employment varies very considerably. Carving and leatherette work are popular, but the bulk of the members devote their time to sewing, knitting, and making lace. Systematic help and supervision are more readily obtained and more regularly given to the girls than to the boys. Young ladies are more free with their time, it would appear, than young men are; and possibly they care for such work more. Well, to both these sections, and especially to the play department, where a swing or two are hung from the rafters, and which is carried on in another room, the infants have the honour of being attached. Not so much good is effected by their admission as was at first expected. The older ones do not relish the attendance and oft-times interruption of the little ones, and the trouble

they cause by being brought and taken away by mothers and older sisters tells against the success of the experiment. The wearing of the badge is an honour, and an inducement to perform a kind act. An idea of this kind wants to be carefully considered before being put into practice. Priggishness may unintentionally be fostered, and kind actions done for some other reason than the highest and the best. Four years has the guild been in existence, and the mistress and managers are of the opinion that some good is being achieved by its means. Guilds are excellent under proper conditions; here the circumstances are all against them.

SCHOOL GARDENING FOR LITTLE CHILDREN.

BY LUCY R. LATTER.

"Earth's crammed with heaven,
And every common bush afire with God;
But only he who sees takes off his shoes."

A GREAT wave seems to be passing over our educational methods to-day, and people are beginning at last to realise that it is "Neither book, nor any product of human skill, but life itself, which yields the basis for all education and instruction," and that the proper atmosphere for little children, at least, to be brought up in, is that in which they can come in daily loving contact with some of the wonderful things of nature, of which they are then so part and parcel. If at any period of life, it is certainly during the first years that immediate contact with living things is of the utmost importance; for, as Friedrich Froebel says: "An instinctive yearning drives a child to busy himself with natural objects. This instinct does not rest satisfied with apprehension of the facts of nature, nor of the secondary principles which govern these; its root lies far deeper. Stripped of all disguises, it is the eternal search made by man after the first, great, personal cause—the Godhead."

Furthermore: "It is," says the same writer, "of the utmost importance that children should acquire the habit of cultivating a plot of ground of their own, long before the period of school life begins, for this reason: nowhere as in the vegetable world can his action be so clearly traced by him, entering in as a link in the chain of cause and effect. The effects are no less due to the intervention of his will than to the sequence of nature."

Communion with nature, then, must have the *first* place in infant (secular) education, and so form the central point of all the other work of the school; for, as the children gather up ever new experiences in their work of tending the plants or animals committed to their care, they will want to express those experiences in some concrete form, be it with paper and chalks building blocks, or any other material—nay, later, they will even want to find out what grown-up people have thought and written about the things which have been engaging their attention and care, and filling their hearts with love and wonder.

Communion with nature is not to be regarded merely as a means of acquiring so much technical knowledge about this or that plant or animal, or this or that natural phenomenon. It is to be primarily the means for awakening and fostering in the children a love of the things of nature. Love in its truest sense means *doing* something for the object cherished, and whilst the children are therefore *busy with the things of nature*, they are quietly acquiring a whole host of experiences which later on become the basis for formal instruction. These experiences are so delightful to the children that they are intensely eager to follow them up and discover new facts for themselves. Every day groups of my own children may be seen gathered in front of the various garden beds before and after—as well as every available moment during—school hours, endeavouring to find out what has happened there since the morning, or the previous day perhaps. The joy with which these children come afterwards to tell whether the snowdrops are nearly ready to ring their dainty bells, whether the winter aconite has appeared with its pretty green frill and lovely golden cup, what plants are still only half awake, and countless other things, amply proves that no better foundation for science and religion can be laid than that loving, reverent interest in nature which has found out by seeking that in this universe of ours,

"All's love, yet all's law."

Such work needs a most careful and skilful organiser, who is a lover of nature in all her forms and varying moods, and who believes that every flower that blows, every creature that creeps, soars, or moves, and every cloud that floats across the vault of heaven, has a divine message for every one who wills to read it. Hence the work should be approached in deep humility and loving reverence, for only so can the Divine life within all things be revealed to us. Since God Himself planted the first garden, a sacred seal has been set upon the work of gardening; and, indeed, "it is the purest of human pleasures. It is the greatest refreshment to the spirits of man, without which buildings and palaces are but gross handiworks."

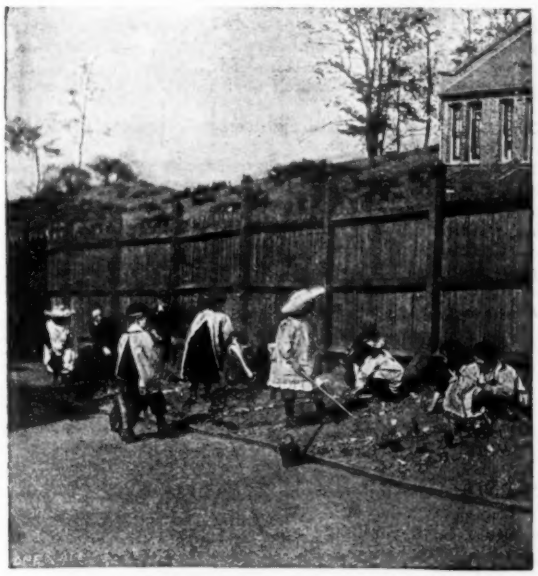
From these few introductory remarks I will now pass on to detail my own experience in school gardening with little children. I will first of all relate very briefly my experience at Deptford, in order to indicate what may sometimes be done where it is not possible to have a garden in the school playground, or even on the school roof. Then I will relate my experience in my present field of work, where a piece of ground has been dug up in the playground and given over to me for gardening purposes with my children.

On the 28th of August 1899, I began my new life-work by taking up my duties as headmistress of the infants' department of the Creek Road Board School, Deptford, a neighbourhood, perhaps, as poor as any to be found in London. It certainly did not seem a place where plants could thrive; but I soon found that with loving care and thought a great deal could be done there in the way of nature work, and ere long there was a nice little array of miniature forest trees (baby oaks and chestnuts, etc., growing in water as well as in earth), and pretty flowers in the various classrooms, for all my assistants were only too eager to co-operate with me as far as they could. Animal pets we also had, although the keeping of them in a school is attended with many difficulties.

There were no facilities for outdoor gardening, but one day, whilst exploring the neighbourhood between the morning and afternoon sessions, I chanced to stray into the old St. Nicholas Churchyard, one of the antiquarian features of old riverside London, its ancient square tower being a landmark from time immemorial for ships and boats on the Thames, and its grim gateway, surmounted with skull and cross-bones, a picturesque survival of the past. It happened to be a hot day, so

I sought shelter from the midday sun under an old plane-tree. Whilst resting there, visions came to me of a garden in that old churchyard, tended by the older children of my school, of groups of my tiny babies playing about among the long grass on a free spot right in front of me, and of countless other joys. These visions were soon to be realised. On the 11th of September the first group of children went with me to the churchyard. There, under the shade of the old plane, we listened to the birds (mostly sparrows), and watched the soft, white, fleecy clouds sail across the blue sky of Deptford. The fruit of the plane-tree arrested the children's eager attention. Was it not "Nature's own little ball on a string?"

From this time forward the St. Nicholas Churchyard became the chief place for our outdoor nature observation. Fallen leaves were gathered up and taken over



SPRING-TIME IN OUR GARDEN.
"Once more the heavenly Power makes all things new."

to the school, which is about three minutes' walk from the churchyard. There they were examined, and then used to make the rooms look pretty. Of special interest were the leaves of the plane-tree, with their wonderful provisions for the protection of the buds of the next year's leaves. The leaves of the poplar also afforded us great pleasure with their graceful, trembling movement.

When the spring came I decided to go a step farther, and one morning I accordingly went to the curate then in charge of the church, the Rev. Alfred T. Wallis, and asked whether I might have a little piece of the churchyard for gardening purposes with my children. My request was most heartily acceded to, and from thenceforth my visions gradually became realities. I soon had a piece of ground about 54 feet long and 4 feet broad under actual cultivation, and the work of the school connected therewith.*

On the 12th of November 1900, I was transferred to my present beautiful school, the "Invicta," Westcombe Park (Greenwich Division). There was not an inside sill to any of the windows in the classrooms or hall on which even small flower-pots could be placed. Soon after the school was opened, however, the Board agreed to put shelves to the windows in question, and also to give me a strip of ground in the playground, near my own department, for outdoor gardening work with the children. In the following summer a portion of our playground, 80 feet long and 8 feet broad, was accordingly dug up and earth laid down where hard asphalt had hitherto existed. A little border of fancy tiles was put round three sides of this strip of ground, which is situated alongside of the fence to the right of the entrance gate, and has a somewhat south-westerly aspect. Practically it gets the weather from all sides, however, for the fence does not offer much protection from north-east winds.

Towards the end of July (1901) we took possession of this strip of ground; but we did not do much with it till after the summer holidays, which were then close at hand. The strip was first of all marked off lengthwise into two portions—(1) a strip against the fence, two feet deep, for a *kitchen garden*, divided by a path 1½ feet in width from (2) a strip, 4½ feet deep, for a *flower garden*. The strip against the fence was then subdivided into eighteen little beds, each 4 feet broad and 2 feet deep, whilst the front strip was subdivided into eighteen beds, each 3 feet broad and 4½ feet deep, separated by paths 1½ feet in width.

The borders and pathways were respectively made of large and small stones, gathered by the children for the purpose, and by permission, from a place near the school where building operations were going on. When all this preliminary work was done—the children always helping in every operation—the beds were allotted out, a girl and a boy getting a bed between them for a year, so that they might observe the sequence in nature and the results of their own labours.

Then the actual gardening began. Potatoes were set in three back beds, and bulbs of many kinds in six front ones, the remaining beds being left for stock plants and spring sowings. In one of the bulb beds were planted three bulbs of the white lily (*Lilium candidum*), some blue squills, and some yellow narcissi, to typify in living form the flower (the white lily) and colours (white, blue, and gold) of our school, as set forth on our unique and beautiful flag. This bed therefore became the special pride of the children.

Then came a period of waiting and watching for the appearance of the plants, the bulbs of which had been so tenderly hidden in the ground by the children themselves. The ever-increasing eagerness with which the earth was watched when it began to "crack" and give signs of something going on beneath could never be described in words, and much less the joy which the gradual appearance of the tender little shoots awakened in the children's hearts. Soon a delicate little snowdrop rose up from the dark earth and shook its dainty bell, as if to summon all the other flowers from their winter sleep.

For the above charming illustration I am indebted to the editor of *One and All Gardening*, Mr. Edward Owen Greening, and I may perhaps be here permitted to record my hearty thanks to him for the permission so readily accorded to use, as I require, the blocks which he had so carefully prepared for this year's "*One and All Gardening*" *Manual* from some pictures made of my children at work in their school garden during the spring and summer of 1902.

(To be continued.)

* A full account of this experiment was published last year in a German magazine. If desired, I should be pleased to give a translation of the same in this paper on some future occasion.

Our Modern Language Section.

DIFFICULTIES OF FRENCH IDIOMS AND CONSTRUCTIONS.

VI.

Fastidieux is not "fastidious" in the sense we give to it of being difficult to please, but "tedious" or "wearisome." The sentence, *Une nourriture trop uniforme devient fastidieuse*, supplies a very good example of the French usage of the word. In French "fastidious" might be translated by *difficile* or *dédaigneux*.

Fier, as an adjective, is not "fierce," but "haughty" or "proud." For instance, we may speak of *une mère fière* or *une contenance fière*, where the idea of the haughtiness of appearance becomes prominent. Boileau's line, "Tout fier d'un sang que vous déshonorez," gives the idea of pride. "Fierce" would be in French *féroce* or *cruel*.

Fou is not "foolish," but "mad." *Les Français enferment quelques fous dans une maison pour persuader que ceux qui sont dehors ne le sont pas.* "Foolish" would be *bête* or *niais*.

Gentil is not "gentle," but "nice" or "amiable." "Il me disait des mots les plus gentils du monde," says Molière. So we may speak of *un gentil* or *une gentille enfant*. "Gentle" in disposition could be well translated into French by *doux*.

Hardi is not "hardy," but "bold." Thus, we may speak of *une démarche hardie, des doctrines hardies*. Racine says, "Burrhus ose sur moi porter ses mains hardies." "Hardy" in the physical sense would be in French *robuste*.

Honnête is not generally "honest," but rather "respectable" or "polite." *Il est honnête avec tout le monde* conveys the latter, and *c'est un honnête homme* the former meaning. The French word *probe* conveys the restricted sense we give to the adjective "honest" in English, just as *probité* would more exactly convey the idea we attach to the quality of "honesty" than would the word *honnêteté*.

Inconséquent is a French word whose construction would mislead us if we did not remember that *conséquent* in French does not refer to sequence of time or of cause. *Conséquent* means "consistent," having a logical connection. *Avoir une conduite conséquente à ses principes* conveys the idea. Voltaire says, "Nos idées sont justes ou inconséquentes."

Instant may be, as in English, a substantive or an adjective. As an adjective it does not refer to time but to urgency. We have the same idea in the somewhat obsolete phrase, "instant supplications." *Un péril instant* means an "urgent danger," and it enables us to see how the ideas of instantaneity of time and urgency are so closely bound up that it is almost impossible to disentangle them.

Large is not "large," but "broad." "Large" would be in French *grand* or *gros*. *Largeur* is hence not total size but "breadth." Corneille says, "Rome à ses agents donne un pouvoir bien large."

To prevent any misconception in the use of *malhonnête* we must remember what has been mentioned above with regard to the word from which it is derived. We shall thus easily see that it means "rude" or "impolite."

Partial and *partiel* both correspond with our adjective "partial," but in different senses. The former word is used to translate our English adjective when it means "attached to one particular view or side," not "impartial." Says La Bruyère, "Un homme partial est exposé à de petites mortifications." *Partiel* means "partial" in the sense that the whole is not involved. Thus we may speak of *une éclipse partielle, une amnistie partielle*.

Particulier does not correspond in meaning with our word "particular." It means "peculiar" to a person or a thing. For instance, *Il a sacrifié l'intérêt général à l'intérêt particulier*.

Plaisant is "jocular," not "pleasant." Our word "pleasantry" is derived from the French substantive *plaisanterie*. *Un mauvais plaisant* is a tactless and unsuccessful joker. Says La Fontaine:—

> "Les humains sont plaisants de prétendre exceller
> Par-dessus nous."

"Pleasant" in French is *agréable*.

Poissonneux is an adjective which might mislead any one who did not look carefully at its construction. It is derived from *poisson*, and means "abounding in fish." The word *poison*, meaning the same as our English word, has no adjective derived from it. "Poisonous" would be *vénéneux* in French.

Rude is not "rude" in the sense of manners or speech. In this sense we should use *malhonnête*. It means "rough," "coarse," or "hard to bear." Le Sage says, "Vous mettez notre amitié à une épreuve trop rude." *Une voix rude* gives the idea of roughness. *Avoir un rude appétit, une rude santé*, are two phrases which show the word in the sense of being impervious to the perils which surround the digestion or the health.

Sage is usually applied to children, and means "good" or "well behaved."

Séculaire and *séculier* are words which might easily be mistranslated into English. The former means "of great age," and is usually applied to trees. Thus we may speak of *un chêne séculaire*. The latter is applied to the ordinary clergy as distinguished from those living under a monastic rule (*règle*). Hence the latter are called *réguliers*. "Secular" as used by us in the sense of worldly would be in French *mondain* or *profane*.

(To be continued.)

ON FRENCH VERSIFICATION.

V.

FRENCH verse differs from English verse in one important particular. While a line of English verse is divisible into a certain regular number of metrical feet, it is impossible so to divide a line of French poetry. English verse is made up of trochaic, iambic, spondaic, etc., feet, according to the position of the accented syllable in each metrical unit. In French, however, as the tonic accent falls on the last sounded vowel, and as French words vary as much as do our own in the number of syllables which compose them, it would be impossible to build French verse on the same rhythmical basis as English verse. While this is so, however, the number of *syllables* which may enter into a particular line of French verse is absolutely fixed, although the number of metrical units composing it may vary. Hence to read French verse aloud is a somewhat different process from reading aloud English verse. To read English verse, merely marking the accented syllables, would be fatiguing to the ears of the listeners, and would not convey the spirit and meaning of what we are reading. We must read it with intelligence. This comprises many features which we cannot now particularise. One feature, however, we must mention, and that is that the reader must give due prominence to the important words. A skilful reader can do this, and at the same time give the due cadence and swing of the piece, so that from a mere *hearing* of the piece we know in what metre it is written. In English we have consequently the *rhythmical accent* and the *thought accent*. In French poetry the place of the *rhythmical accent* is not, as with us, determined by the number of poetic feet, but by other considerations which we shall explain. The *thought accent* cannot, of course, be subjected to fixed rules. It must be left to the reader's intelligence, and it is possible that two readers may in some cases differ in opinion as to where the thought accent should fall.

The classic Alexandrine school required a fixed accent at the end of each half-line, the first coinciding, of course, with the cæsura and the second with the end of the line. In addition to these, too, there were one or more secondary accents which fell on the important or most sonorous words. The two fixed accents we should call the *rhythmical accents* and the others the *thought accents*.

"Tu te tais maintenánt | et gardes le silénce."
Corneille.

The rhythmical accents here fall on the last syllables of *maintenant* and *silence*, as in the following extract they fall on the final syllables of *printemps* and *rose* :—

"O jours de mon printémps | jours couronnés de rose."
André Chénier.

In the following extracts we have marked the thought accents as well as the rhythmical accents :—

"Mais si mon cœur voulait | rentrér dans sa prison."
Molière.

"Un brouillárd de fumée | où la flámme étincélle."
A. de Vigny.

The two examples we have given are characteristic of the classical Alexandrine line, which usually contains two principal and two secondary accents.

As we have already explained, the poets of the Romantic school do not consider the rule of the cæsura falling in the middle of the line as binding on them. Hence the sixth syllable frequently falls on an unimportant word, and bears only a very slight rhythmical accent. The Romantic poets have introduced a new rhythmical variation of the Alexandrine in what has been called the *Alexandrine trimètre*. In this there are *two cæsuras*, so that the line divides itself into three rhythmical groups. This verse owed its introduction to Victor Hugo, from whom we give two examples of it :—

"Comme un infáme | comme un láche | comme un chién."

"Vous me manquéz | je suis absénte | de moi-méme."

Later poets have adopted it, as the examples below show :—

"L'onde immense, | le ciel profond, | l'ombre infinie."
Jean Richepin.

"Des bandáges | couvraient son front | et sa poitrine."
Paul Déroulède.

The introduction of this new rhythm into French poetry has imparted vigour, life, and variety to the Alexandrine verse, and has relieved it from the monotony into which it is so apt to fall. A skilful mixture of the *vers trimètre* with the regular Alexandrine produces an effective combination, which easily lends itself to the portrayal of varying emotions and to the production of varying poetic effects.

With this paper we bring to an end the series. We trust that, although we have treated the subject imperfectly, we have done something to increase our readers' knowledge of the structure of French verse, and to give them a new interest in the productions of the great French poets.

FRENCH PRIZE COMPETITION.

RULES.

1. All translations should be **posted not later than March 8**, and addressed :—PRIZE EDITOR, Office of the *Practical Teacher*, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.

ALTERATION IN RULE 3.

3. Competitors should write pseudonym only on MS. Prize-winner will be asked to send name and address for publication.
4. No competitor may take the prize offered more than once in three months.

A Prize of Half a Guinea is offered for the best rendering into English of the following extract :—

Soyez convaincue, poursuivit-il, qu'il y a chez ces messieurs du monde un vice inhérent à leur qualité. Leur défaut à presque tous c'est de ne savoir à peu près rien faire par eux-mêmes. Ils n'ont appris qu'à commander, à donner des ordres. Or, dans les affaires, ces mêmes mots, qui continuent à exprimer un genre de procédé, acquièrent une signification bien particulière. Commander, donner des ordres, cela veut dire désormais prendre à sa charge des milliers de choses, se mettre sur les bras des milliers de responsabilités. Et comment voudriez-vous que ces messieurs pussent se débrouiller eux-mêmes là-dedans ? Ils ont toujours eu un valet de chambre pour préparer leur habit, leur chemise et leurs escarpins ; des parents leur ont préparé de la fortune. Et c'étaient le notaire et l'agent de change qui, au jour le jour, leur préparaient leurs droits et leurs revenus. Et pendant qu'ils dilapidaient leur héritage, une jeune fille mûrissait à leur destination, leur préparant à dîner de sa dot lorsque, vers la trentaine, ils auraient fini de déjeuner de leur argent. Oui, mais ce sont, plus tard, l'heure et le besoin du souper qui peuvent survenir ; et, à ce moment-là, il n'y a plus personne pour le leur servir...du moins aussi bénévolement. Allez, le caractère de ces gens accoutumés aux facilités de la haute vie ne se corrige pas quand ils s'installent dans le bureau, avant tout confortable, où ils vont censément brasser tant d'affaires. Rien qu'à se sentir si seuls, leur premier soin est de faire poser vingt-cinq sonneries, comme pour y appeler électriquement le diable et son train à leur service. Alors, savez-vous qui est-ce qui arrive infailliblement au fur et à mesure qu'ils pressent sur les boutons ? C'est l'agent véreux d'affaires, qui vient les débarrasser de leurs droits ; l'huissier qui s'empresse de mettre la main jusque sur leurs vêtements et leur linge ; et enfin parfois le commissaire de police, qui procède à son tour, pour les alléger du peu d honneur qu'il y aurait encore en caisse.

PAUL HERVIEU.

RESULT OF THE FEBRUARY COMPETITION.

The prize is awarded to "Amry." Will "Amry" kindly send name and address for publication ?

First Class.— Fitzthomas, Annalise, C.E.M., Guillaume, Dewhurst, Gianello, Aspirant, La Printanière, Lytton, Robbie, E.B.C., Conona, J.N.M.P., Edzell, Georgette, Penarth, Yorick, Garryhesta, Perthshire, Welburn, Borealis, Day Dawn, Eboracum, Y.L.O.M., L'hommeau, Kelso, Alceste, Pendragon, Festina lente, Hélène, Dunoon, Jennie, Tyro, Mathilde, Claren, Pixy, Lissa, The Country Girl, Agaznog, Bell Heather, Lorine, Adlitam, Souter Johnny, Jane, Aim, Moss Rose, Tetrahedron, Ardudfyl, Horatius, Dunciani, S.N.D., Ceylon, Cœur-de-Lion, Nemo, Bea, Lumen, B.S., Bam, Bobs, Arsanca, Peggy, Ephèbe, Cynic, Blinsee, Strebor, Guglielmo, Woolley, Mann, D'Arcy, Lorna, Kippen, Isis, Edelweiss, Nona, Shakspere.

Second Class.—Une Ecolière, Grimbarian, Pickles, Bhuoy, Radium, Padua, Hop-o'-my-Thumb, Once again, Croissant, Remis, Rosa, Virginia, Esmond, Coochie, Arthur H., Saxonne, Wee Macgregor, E. de M., Afgy, Ap Owen, Azile, Rex, Meriden, Competition, W.M., Ess-Ess-Bee, Janet, Skreb, Draughts, Topsy, Arc, Cassandra, Belle Isle, Excelsior, Davina, R.N., Pov, Mrs. Quirp, Viso, X.Y.P., Aphrodite.

Sent in last month's, Vœsaire.

Report.

There were only two real difficulties in the piece. The first was concerned with the question whether *parallèles* in *tendresses parallèles* should be translated literally. The answer is that it decidedly should be translated literally, or the metaphor in *ne se rencontreraient jamais* would not be preserved. The second difficulty was the translation of *ménage*. Too many relied merely on dictionaries, and translated it "household ;" but, as a distinguished critic said of a still more distinguished poet's work, "This will never do." The distinction drawn is between the act of marriage and

the married life. *Ménage* should therefore be translated as "married life," "married state," etc. I had one or two funny renderings of *mais après les noces*, etc. A specimen of such is, "Near the wedding day the betrothed meet every day, and occasionally come to blows." Fortunately the Prize Editor has only to pronounce on the accuracy of the translation: on the accuracy of the above translation his verdict is a negative one. With the accuracy of the fact he leaves more experienced people to deal.

Prize Translation.

"Why do people marry, from reciprocal inclination, if they are not resolved to give equal and parallel signs of affection?"

"Parallel signs of affection," the baron objected, "would be those which would never meet; they, in fact, would not wear out by contact. But after the wedding you meet every day, and sometimes run counter to one another..... Without playing upon words, I am sure that marriage, in other respects to be admired, is in reality an invention for disenchanting romantic people most speedily."

"Oh! oh! godfather," cried Geneviève, "those are the words of an old bachelor."

"And of an old bachelor who would be glad to find he was mistaken, but who has hit upon the truth. Marriage would be delicious if it lasted. Alas! life is not a wedding, but is spent in the home. Marriage is an act; it may be accomplished in the passion of the very feeling which carries you off your feet; for an act only lasts a moment. But wedded life is a state; it is even a perpetual state, which lasts after you have awoke from all your dreams. Married life has no connection with marriage. And yet all betrothed lovers confuse the one with the other. What a deplorable error! What a source of disappointments! And how prudent it would be to write in big letters on the certificates given to the wedded pair by mayor and priest, 'There are love-matches, there is no wedded life for love!'"

"Or else," Geneviève proposed, "'Take care, bride and bridegroom! eternal illusions are forbidden.'" AMRY.

UNIVERSITY OF LONDON.

MATRICULATION EXAMINATION:

January 1904.

FRENCH.

Examiners { Prof. LOUIS M. BRANDIN, PH.D., L. ES L.
{ ELPHEGE JANAU, Esq.

THURSDAY, January 14—*Morning*, 10 *to* 1.

I. Translate into English:—

A.

Vie d'un Châtelain au Moyen Age.

A l'isolement du château et de ses habitants se joignait l'oisiveté, une oisiveté singulière. Le possesseur du château n'avait rien à faire, rien d'obligé, rien de régulier. Chez les autres peuples, à leur origine, dans les classes supérieures même, les hommes ont été occupés, tantôt par les affaires publiques, tantôt par des rapports fréquents et de divers genres avec les familles voisines. On ne les voit jamais embarrassés de remplir leur temps, de satisfaire leur activité: ici ils cultivent et font valoir de grandes terres; là ils conduisent de grands troupeaux; ailleurs ils chassent pour vivre; en un mot, ils ont une activité obligée. Dans l'intérieur du château, le propriétaire n'a rien à faire; ce n'est pas lui qui fait valoir ses champs; il ne chasse point pour sa nourriture; il n'a point d'activité politique, point d'activité industrielle d'aucun genre; jamais on n'a vu un tel loisir dans un tel isolement. Les hommes ne peuvent rester dans une situation semblable; ils y mourraient d'impatience et d'ennui. Le propriétaire du château n'a pensé qu'à en sortir. Enfermé là quand il le fallait absolument pour sa sûreté ou son indépendance, il est allé, aussi souvent qu'il l'a pu, chercher au dehors ce qui lui manquait, la société, l'activité. La vie des possesseurs de fiefs s'est passée sur les grands chemins, dans les aventures. F. GUIZOT.

B.

Les rochers de Carnac.

Nous nommons ces rochers Soldats de Cornéli.
Écoutez: les soldats de deux rois idolâtres
Poursuivaient notre saint, déjà l'ami des pâtres,
Et, sur un chariot traîné par de grands bœufs,
Le bon vieux Cornéli se sauvait devant eux;
Or, voici que la mer, terrible aussi, l'arrête;
Alors le saint prélat, du haut de sa charrette,
Tend la main: les soldats, tels qu'ils étaient rangés,
En autant de men-hir,* voyez! furent changés.
Telle est notre croyance; et personne n'ignore
Que le patron des bœufs, c'est ici qu'on l'honore.
Aux lieux où la charrette et le saint ont passé,
Le froment pousse encor plus vert et plus pressé.

AUGUSTE BRIZEUX.

II. EITHER (*a*) Translate into French:—

Friendship.

Friendship is the union of two persons in mutual affection and remembrance of one another. The friend can do for his friend what he cannot do for himself. He can give him counsel in time of difficulties; he can teach him "to see himself as others see him;" he can stand by him when all the world are against him; he can gladden and enlighten him by his presence; he can "divide his sorrows," he can "double his joys;" he can anticipate his wants.....According to the common saying, true friends find one another always the same. The greatest good of friendship is not daily intercourse, for circumstances rarely admit of this; but on the great occasions of life, when the advice of a friend is needed, then the word spoken in season about conduct, about health, about marriage, about business—the letter written from a distance by a disinterested person who sees with clearer eyes, may be of inestimable value. When the heart is failing and despair is setting in, then to hear the voice or grasp the hand of a friend, in a shipwreck, in a defeat, in some other failure or misfortune, may restore the necessary courage and composure to the paralysed and disordered mind, and convert the feeble person into a hero. B. JOWETT.

OR (*b*) Write in French an essay of about 20 lines (that is, about 200 words) on *one* of the following subjects:—

Francis Drake, Disraeli, Darwin.

III. GRAMMAR.

1. Give in columns:—

(*a*) The feminine singular of: *habitants, régulier, fréquents, ils, roi, moyen, tous, vieux, eux, étrangers.*—(*b*) The masculine plural of: *singulière, publiques, grandes, sa, longue, laquelle, notre, industrielle, patron, aventureuse.*

2. Write in columns:—

(*a*) The present infinitive of: *joignait, avait, occupés, voit, conduisent, chassent, est, fait, peuvent, mourraient, fallait, allé, dit, manquait, vainquit, poursuivaient, tend.*—(*b*) The second person plural of the present subjunctive of: *satisfaire, rempli, cultivent, obligée, valoir, ont, peuvent, sortir, allé, vivre, vu, font, chercher, poursuivaient, se sauvait, tend, rangés, changés, furent, ignore, passé, pousse, pressé.*

3. Translate into French:—

(*a*) I expect you to send me this parcel to-morrow without fail.—(*b*) Though I know it is absolutely certain, I can hardly believe it.—(*c*) It is said that his father is likely to go to Switzerland.—(*d*) It is much better to have wise enemies than imprudent friends.

4. Translate into French, expressing all numbers in words:—

(*a*) He divided it and gave a third to each of us.—(*b*) The first turning on the right will take you straight to the house.—(*c*) The son died a fortnight later, on May 31, 1901.—(*d*) Multiply $2\frac{1}{2}$ by $3\frac{1}{4}$; then subtract 4·3 and the result will be the sum due.

5. Translate into French:—

(*a*) Is it possible that you have not yet received the letter I sent you a week ago?—(*b*) However indifferent he may be towards me, he will be obliged to help me in the present circumstances.—(*c*) Read this piece over and over again until you know it by heart.—(*d*) I do not wish to tell you anything before your brother and sister have gone.

* English: menhir.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Late Principal of the Belvedere Pupil Teachers' Centre, First on Scholarship List; Author of "Scholarship School Management," "Building of the British Empire," etc.

NEW SCHOLARSHIP COURSE FOR DECEMBER 1904.

Third Month—March.

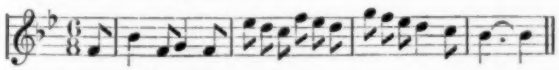
Work to be Prepared.

1. *Reading and Repetition.*—The oral part of these subjects needs great attention.

2. *Teaching.*—Chap. iii., *Scholarship School Management:* Teaching Aids. Much of the success of any lesson depends upon the use made by the teacher of the usual aids employed to fix facts upon the memory. Bearing in mind the teaching of the first chapter that the presentative faculties, sight and touch, develop earlier and quicker than the representative faculty imagination, it is essential that visual representations should be used as much as possible. The blackboard is continually used by the good teacher, not only for the usual blackboard lesson, but for sketches, diagrams, maps, plans, etc. Modelling-clay should be used in geography lessons. The physical features should be built up before the class, and the final relief map thus obtained has far more educative value than any wall sheet. In many subjects simple experiments may be made. These are always intensely interesting to children, but they frequently lose much of their efficacy through ignorance of proper method on the part of the young teacher—in the first place, because the children are not told exactly what to watch; and secondly, because the deduction from the experiment is told instead of being elicited. The class must be trained to observe accurately and deduce correctly, or the experiment is useless.

3. *Drawing.*—One or two copies each week, together with sketches from nature of simple objects. The latter is very rarely done by students, but a little consideration will show that to study the original is better than studying a copy. I shall be pleased to give a small prize for the best sheet of brush drawings of leaves of English trees—one leaf showing the junction of the stalk with the stem—sent in during the month. Of course, leaves are not the only common objects that should be sketched; flowers, fruit, gateways, fireplaces, etc., all provide abundant material.

4. *Music.*—Easy transposition from one key to another, or from one notation to another. This is a very useful as well as easy exercise. Take any common song or hymn tune or passage in Staff Notation, for example:—



Now write this in Tonic Sol-fa.

(1.) The first thing to fix is the key. This is from the signature B♭.

(2.) The next point is the time. $\frac{6}{8}$ in Staff Notation is six-pulse in Sol-fa.

(3.) Then prepare the requisite number of measures, and copy in the notes, remembering that the middle is in the scale **d**.

KEY B♭.

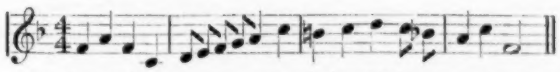
{:s,|d:-:s,|l,:-:s,|f:m:r|s:f:m|l:s:f|m:-:r|d:-:-|-:-:-‖

Or conversely, take a passage in Sol-fa. For example:—

KEY F.

{|d :m |d :s, |l,t,:d.r|m :s |fe:s |l :s.f|m :s |d :- ‖

This becomes—



The **fe** at the commencement of the third measure is represented by sharpening B♭—that is, making it natural. This necessitates a flat sign before the B at the end of the measure.

If any difficulty is experienced, send up for help.

5. *Penmanship.*—Ten minutes' daily practice.

6. *Composition.*—Write one or two essays each week on such subjects as—

(*a*) The Japanese, and developments in Japan.
(*b*) History is mainly the biographies of great men.
(*c*) The darkest day, wait till to-morrow, will have passed away.
(*d*) The effects of the feudal system.
(*e*) Still waters run deep.
(*f*) Uses and abuses of advertising.
(*g*) Benefits of nature study.
(*h*) The character of some great man.

Read up the subjects, if necessary. Make an analysis of your ideas, and arrange in proper sections before commencing to write. Write the essay out roughly, and then go over it again and again, polishing the expression and phrasing.

Notes on the subjects set:—

(*a*) The geography text-book will supply much information. It is inevitable that a contrast should be made with the Chinese. Both were exclusive and suspicious of European influence; but whereas the Japanese, since the country was opened in 1856, have absorbed Western ideas with rapidity, the Chinese still remain bitterly hostile and conservative.

(*b*) This will appear on a little investigation to be mainly true. Well-written and selected biographies teach history better than a continuous narrative. Hence it is that the Old Testament history, being mainly biographical, is better known than is English history.

(*c*) Examine the truth of this. It is not always true, but it expresses the hope which "springs eternal in the human breast" that there is a good time coming. Point out how this has supported men through many difficulties and dangers, which would otherwise have been overwhelming.

(*d*) No scholarship student should find difficulty here. The Feudal System, based on the fighting instinct of man, fostered it and kept it alive, to the exclusion of higher and nobler thought. It was not till the Feudal System had decayed that the Renaissance could take place. The chivalrous spirit was certainly developed, but this is only a small part of the perfect man. The evil result of dividing men into two classes—privileged fighters and non-privileged slaves—was not so apparent in England as in France, since the class distinction was broken down much earlier and more gradually.

(*e*) Take the literal meaning and exemplify it, then apply it to mankind at large.

(*f*) and (*g*) require no hints. (*h*) affords a good example for the display of thought and expression, but can only be attempted where a good biography has been read.

7. *English.*—

(*a*) Twenty-five roots and meanings each week.
(*b*) *Much ado about Nothing*, Act II., Scene i.
(*c*) The essay on marriage and single life.
(*d*) The strife of tongues 1066–1250.

8. *Geography.*—(*a*) Finish the revision of Europe; (*b*) British possessions in Africa (excluding South Africa).

With regard to Europe, special knowledge is required of scholarship students. Not only should the scope of the pupil-teacher syllabus be thoroughly mastered, but special attention should be given to the following points—the interchange of productions, either raw material or manufactured goods; the centres of particular industries, and the reasons why they are thus located; the Continental railways and trade routes; the great river basins; a fuller knowledge of the chief towns; and a detailed knowledge of the various forms of government. The following questions indicate what is required—

(1.) Describe exactly how Germany is governed.

(2.) Describe the course of the Rhine, naming the countries between or through which it passes, the chief tributaries, and the principal towns on its banks. (A sketch map should be drawn.)

(3.) Describe the situation of the following cities—Rome, Naples, Florence, Milan, Turin, so as to compare their fitness to be capital of Italy.

(4.) What is the chief town of each of the following territories, and of what country is it a part—Baden, Catalonia, Finland, King's County, Moravia, Posen, Tuscany, Vaud, West Flanders?

(5.) Name the states of the Balkan peninsula, with their capitals. How is each governed?

(6.) Describe a journey by rail from Calais to Brindisi. How long would it take?

(7.) What are the imports to England from Lisbon, Bilbao, Patras, Nantes, Smyrna?

(8.) From what districts of Europe does England import butter, champagne, cork, currants, iron, raisins, silk, and timber?

(9.) What are the Campagna, Dobrudscha, Landes, Riviera? Give the situation of each. What makes Lombardy so fertile?

(10.) Name some of the most famous buildings in Europe. State their locality, and say why they are famous.

(11.) Give a short account of one of the following—

(*a*) The social life of the Dutch.

(*b*) Italian unity.

(*c*) France as a republic.

(12.) Name the "Great Powers" of Europe, and distinguish between their modes of government.

(13.) What have been the chief changes in the political map of Europe since 1815?

(14.) Name the chief naval stations of Germany, Austria, Russia, and Italy, and explain the special importance of each.

(15.) What parts of Europe have been under the dominion of the Romans, Moors, Tartars, and Ottomans? Point out any results of such dominations.

The African possessions are important, mainly as trade centres, and the ports, imports, and exports must be thoroughly known. The history should also be learned. The British occupation of Egypt, its causes and effects, is also a favourite topic for questions.

9. *History.*—Henry the Second to end of Henry the Third.

This is a very important period, covering the dawn of representative government. The chief points to be studied are:—

Henry the Second.—Possessions, and how obtained; quarrel with Becket—causes and results; conquest of Ireland; rebellion of sons. Legal reforms: these are most important—Justices-in-eyre, scutage, inquest of sheriffs, assize of arms, etc.

Richard.—This reign brings England into close touch with the Crusades. Read Scott's *Talisman*.

John.—The loss of the Norman possessions, and the *good* effects on England; quarrel with the Pope; interdict and excommunication; Magna Charta.

Henry the Third.—Early government under justiciars; personal misrule; the Barons' War, leading to the first Parliament representative of all classes.

10. *Arithmetic.*—The metric system, practice, and equations, and Nos. 201–300 of the General Examples at the end of the book.

The metric system is very fully explained in the text-book, and abundant exercises are given. If any difficulty is experienced, students must write.

The chapter on equational problems must be very carefully studied, and ALL the exercises worked.

11. *Algebra.*—Quadratic equations. These may be solved (*a*) by factors, (*b*) by completing the square, (*c*) by formula.

Examples: (*a*) Solve— $x^2 + 5x = -6$.

Then $x^2 + 5x + 6 = 0$, or $(x + 2)(x + 3) = 0$.

Since the product is 0, one of the factors must equal 0. If $x + 2 = 0$, $x = -2$; if $x + 3 = 0$, $x = -3$. Ans. -2 or -3.

(*b*) Solve— $x^2 + 8x = -12$.

The sum must always be arranged thus. If there is a coefficient to x^2, divide the whole equation by it.

Then $x^2 + 8x + (4)^2 = -12 + 16$.

This is obtained by adding the square of half the coefficient of x to each side. This makes the left-hand side a perfect square. Then take square root.

$$x + 4 = \pm 2,$$
$$x = -4 \pm 2 = -6 \text{ or } -2.$$

(*c*) The method by formula is generally most convenient. Any equation may be arranged as $ax^2 + bx + c = 0$, where a = coefficient of x^2, b = coefficient of x, and c = numerical quantity.

Divide through by a— $x^2 + \frac{b}{a}x = -\frac{c}{a}$.

Add the square of half coefficient of x—

$$x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = \left(\frac{b}{2a}\right)^2 - \frac{c}{a}.$$

Take square root— $x + \frac{b}{2a} = \sqrt{\left(\frac{b}{2a}\right)^2 - \frac{c}{a}}$

$$x = -\frac{b}{2a} \pm \frac{1}{2a}\sqrt{b^2 - 4ac}$$
$$= -\frac{b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Learn the proof that a quadratic cannot have more than two roots.

12. *Euclid.*—Props. 21–30, with six deductions per week.

13. *Elementary Science.*—Heat, radiation, electricity, and chemical action as forms of energy. Mechanical work.

Discrimination between heat and temperature. Effects of heat. Measurement of temperature by thermometers. Conduction and convection.

The text-book deals clearly with these points. Write if any difficulty is experienced. Students must distinguish very carefully between amount of heat (measured by calorimeter) and the temperature (measured by thermometer). If you know a liquid is at 60° F., you do not know the amount of heat, any more than if you were told a pond was six feet deep you could tell how many gallons of water it contained.

14. *General Information.*—Read up answers to two or three papers in one of the books of questions recommended.

The mental habit of finding out the why and wherefore of everything must be cultivated.

Test Paper in General Information.

Answers will be marked gratis if sent direct to Mr. A. T. Flux, Oakleigh, Belvedere, Kent, and stamped addressed envelope enclosed for return.

1. Explain how a newspaper is printed.

2. How is a common match made? What is the difference between a safety match and other matches?

3. How are tides produced? Why does the tidal wave move south to north in some places, north to south or east to west in others?

4. What do you know about radium?

5. What are the causes of dispute between Russia and Japan?

6. Mention some safe means of investing small amounts of money. How does the rate of interest paid indicate the safety or otherwise of the investment?

7. What is "Tammany," a "corner," a Pulman car, a blizzard?

8. Explain the difference between *Protection* and *Free Trade*.

Test Questions.

1. What is "Induction"? How would you try to teach the fact that metals expand when heated?

2. Name the intervals which each of the following notes makes with the others—**d, ma, fe, ta.**

3. Analyse the following, and parse words in italics—

> My love is there *to teach*; teach it *but how*,
> And thou shalt see how *apt* it is *to learn*
> Any hard lesson that may do *thee good*.

4. Write a brief analysis of the essay on Revenge, and give the substance of it in your own words.

5. Explain clearly how India is governed. What do you understand by caste?

6. Say what you can of the chief industries of Holland, and where they are carried on.

7. What was the Investiture dispute, and how did it end?

8. What effects had the Conquest on the home life of the people?

9. Work the following—

(*a*) Find the value of the series $\frac{1}{2} + \frac{1}{2 \times 3} + \frac{1}{2 \times 3 \times 4}$, etc., accurately to five places of decimals. Ans. ·71828.

(*b*) Show that $\frac{1}{3} + \frac{1}{7^3} + \frac{1}{7^5}$, etc., to infinity $= \frac{12}{49}$.

(*c*) What is meant by the "reciprocal" of a number? What fraction divided by its reciprocal $= \frac{4}{9}\frac{9}{3}$? Ans. $\frac{7}{9}$.

(*d*) A woman has a certain number of eggs. She sells $\frac{3}{5}$ of the number and one more to A, $\frac{3}{8}$ of the remainder to B, ·5 of the remainder to C, and has 15 eggs left. How many had she at first?

10. Find the H.C.F. of

$18x^3 + 9x^2 - 40x - 21$, and $12x^3 + 8x^2 - 27x - 18$.

Ans. $x^2 + 5ax - 11a^2$.

11. If the middle point D be taken of the hypotenuse AC in the right-angled triangle ABC, then DA = DB = DC.

12. (*a*) You have six single pulleys. How would you arrange them to lift the greatest possible weight?

(*b*) A gradient is 1 in 88 on a railway track. What force is required to keep a truck weighing 20 tons from rolling down?

PUPIL TEACHERS' COURSE.

For Candidates' Examination, 1904.

1. *English.*—Finish revision of the special books.

2. *Arithmetic.*—Work any general examples on the year's syllabus.

3. *Geography.*—The general features of Africa and America. Draw a large sketch map for each continent. Enter on it the names of all places to be remembered, and go over continually till known.

4. *History.*—Finish George the Third, George the Fourth, William the Fourth, and Victoria. Learn lives of Bonaparte, Nelson, Wellington, Peel, Wilberforce, etc. Be prepared to describe the Battles of Waterloo, Nile, Trafalgar.

The Catholic Emancipation and the Reform Bill are very important.

5. Finish revision of science and music.

Final Test Examination on the Year's Work.

The answers to the questions will, if desired, be marked and criticised for a fee of two shillings. Answers must be sent direct to Mr. A. T. Flux, Oakleigh, Belvedere, Kent.

1. Penmanship.

(Ten minutes. Twenty marks.)

Write as specimens of copy-setting:—
Large Hand.—*Parallelogram.*
Small Hand.—*Full many a gem of purest ray serene*
The dark unfathomed caves of ocean bear.

2. English.

(One hour. Eighty marks. Answer *three* questions, including the first, if you can.)

1. Analyse one of the following passages, and parse the words in italics in the piece selected:—

(*a*) There at the foot of *yonder* nodding beech
That wreathes its old fantastic roots so high,
His listless length at noontide *would* he *stretch*,
And *pore* upon the brook that babbles *by*.

(*b*) The insect youth are on the wing,
Eager to taste the honied *spring*
And float amid the liquid noon.
Some show their gaily-gilded trim
Quick glancing in the sun.

2. Explain simply—Attic warbler, cool zephyrs, fretted vault, ingenuous shame.

3. What is the meaning and use of the suffix in the following words—Forgetfulness, guiltless, whom, disdainful, responsive, flutter, moralist?

4. Define the following, and give examples from the poem you have studied—nominative case, passive voice, imperative mood.

5. What are the different kinds of subordinate sentences? Give an example of each.

3. Arithmetic.

(One hour. One hundred marks. Answer *three* questions.)

1. (*a*) What is the sum of the three largest and three smallest numbers that can be formed with the digits 2, 9, 8, 6?

(*b*) What is wrong in the following—
As 2 books : 4 shillings :: 4 books : 8 shillings?

(*c*) Define multiple, common multiple, greatest common multiple.

2. Compare the fractions $\frac{15}{16}$, $\frac{23}{25}$, $\frac{111}{123}$, $\frac{31}{34}$, $\frac{11}{12}$, and find the product of the sum and difference of the greatest and least.

3. Find the value of $(\frac{3}{7} + \frac{4}{5})$ of four guineas + $(\cdot0\dot{9} - \cdot\dot{0}\dot{1})$ of £2, 1s. 3d. + (5·05 ÷ ·005) of 5s.

4. Make out the following bill:—

17½ lbs. of mutton at 9½d. per lb.
5¼ lbs. of mutton at 11d. per lb.
13 lbs. of beef at 10¾d. per lb.
7 lbs. of beef at 11½d. per lb.
19 lbs. of bacon at 7¼d. per lb.

What would be left out of a £5 note after paying the above, the butcher allowing a discount of 10d. in the £?

5. If a farmer pays a rent of £100, 19s. 10½d. for a farm of 53 acres, 2 roods, 20 poles, and his landlord remits one quarter of the rent, what does he pay per acre?

What is meant by "rule of three direct," and the "rule of three inverse"?

4. Geography.

(One hour. Eighty marks. Answer *three* questions.)

1. In what districts of England are cotton, woollen, and iron manufactures respectively carried on?

2. Describe the general physical characteristics of Australia.

3. Describe accurately the position of Lough Corrib, Lough Foyle, Lough Mask, and Lough Neagh. Where are Athlone, Giant's Causeway, Killarney, Limerick, Londonderry, and Queenstown?

4. Describe the position of the Caledonian Canal, the Orkneys, the Grampians, the Ochil Hills, the Scotch University towns, the course of the Clyde.

5. What Asiatic peninsulas correspond in position to those in the Mediterranean? Make a list of the chief rivers in Asia.

5. History.

(One hour. Eighty marks. Answer *three* questions.)

1. Mention ten important Acts passed by Parliament, and give an account of one of them.

2. Write three or four lines about four of the following:—Dunstan, Becket, De Burgh, Warwick the King-maker, Drake, Marlborough.

3. Give an account of one of the following:—
(*a*) The Peasants' Revolt.
(*b*) The Great Fire of London.
(*c*) The Battle of Waterloo.

4. Mention all the insurrections you can that have taken place in England, and describe in detail one of them.

5. Write explanatory notes on Mortmain, Black Death, Solemn League and Covenant, South Sea Bubble, Chartists.

6. Elementary Science.

(One hour. One hundred marks. Answer *two* questions.)

1. How do you find the specific gravity of a liquid?

A solid weighs 17 ounces in air, and 15½ ounces in water. What is its specific gravity?

2. Two iron bars of equal length and thickness are fastened together without overlapping so as to make a figure in the shape T. Show by a diagram where the centre of gravity is.

3. Why does a cyclist fall over the handle-bars if the machine is suddenly stopped? Explain fully.

4. Draw a diagram of the common suction pump, and explain its action.

5. A stone let fall from a balloon reaches the ground in five seconds. How high is the balloon?

7. Music.

(Fifteen minutes. Fifteen marks. Answer *three* questions.)

1. What other groups of contiguous scale tones are separated by the same interval steps as the following:—

d r m f s ‖ l_1 t_1 d r m?

2. Name the following intervals—**f-l, s-d', r-d', m-t, t_1-f.**

3. Copy the following, and write over each note and rest its value in pulses or fractions of a pulse:—

|m : d.m : s |f : -.m : r |m : - : |s : -.t_1 : d ‖

First Year.

The whole of the syllabus, with the exception of the English, has now been covered. The English should be completely finished this month, and all the other work revised. A test examination on the year's work is given below. Those who wish to have their answers corrected should send them direct to Mr. A. T. Flux, Oakleigh, Belvedere, Kent, together with a postal order for two shillings.

1. Penmanship.

(Ten minutes. Twenty marks.)

Write as specimens of copy-setting:—
Large Hand.—*Genealogical.*
Small Hand.—*The quality of mercy is not strained,*
It droppeth as the gentle rain from heaven.

2. Composition.

(Thirty minutes. Fifty marks.)

Write an essay on one of the following :—

(*a*) Cowper's poetry.
(*b*) Freedom.
(*c*) Nature study and its advantages.

3. English.

(One hour. Eighty marks. Answer *three* questions.)

1. Analyse one of the following passages, and parse the words in italics :—

(*a*)
Know then
That, *while* laborious and quick-thoughted man
Snuffs up the praise *of what* he *seems to plan*,
He first conceives, then perfects his design
As a mere instrument in hands Divine.

(*b*) *Conscious* of impotence, they soon *grow drunk*
With gazing, when they see an able man
Step forth to notice ; and besotted *thus*
Build him a pedestal and say, "Stand there
And *be* our admiration and our praise."

2. Explain clearly three of the following :—Storks among frogs ; the Vulcan of old times ; Aristæus found Cyrene ; thy senate is a scene of civil jar ; Peruvian mines ; proud eagles of all-conquering Rome.

3. Give the etymology of six of the following words :—Introduction, illimitable, connected, retrospect, septennial, transportation, subaqueous, revolution, magnanimous.

4. Define, with examples, nominative absolute, gerund, passive voice.

5. Explain how you would give a first lesson on analysis.

4. History.

(One hour. Eighty marks.)

1. Write short accounts of Lanfranc, Simon de Montfort, Wat Tyler, Bishop Hooper.

2. Under what circumstances did Edward the Third interfere in Scotch affairs ? Sketch briefly the result.

3. State the position of the following, and say for what events they are noted—Dunbar, Fotheringay Castle, Field of the Cloth of Gold, Runnymede, Bosworth, Lewes.

4. What was the claim of Mary Queen of Scots to the throne ? Why did the Scots rebel against her, and why did Elizabeth put her to death ?

5. What were the chief difficulties which confronted Elizabeth at the commencement of her reign, and how did she deal with them ?

5. Geography.

(One hour. Eighty marks. Answer *three* questions.)

1. Draw a sketch map of India, showing its chief physical features.

2. State the position of these places, and mention for what each is best known—Lyons, Moscow, Delhi, Mecca, Korea, Dead Sea, Strait of Malacca, Cape St. Vincent.

3. Name the states of Germany with their capitals, and indicate by a sketch map or otherwise their position relatively to each other.

4. Name the states in the Balkan Peninsula ; give their capitals, and say which of them are under the supremacy of Turkey.

5. What are the monsoons ? Show how they affect the fertility of different parts of India.

6 Arithmetic.

(One hour. One hundred marks. Answer *three* questions, including the first, if you can.)

1. What is a multiple of a quantity ?

(*a*) Prove that there is no multiple of 119 between 10,000 and 10,100 inclusive.

(*b*) Find in tons, and decimal of a ton, the greatest integral multiple of 4 tons 1¾ cwt. that does not exceed 407 tons.

2. Find the value (by practice, if you can) of 36¾ times £1, 1s. 10½d. Thence find in the easiest way 36 17/20 times £1, 1s. 10½d.

3. Prove that the first result in Question 2 has to the second the same ratio that 12 min. 50 sec. has to 12 min 53 sec., and a greater ratio than that of £1 to £1, 1s. (You need not work No. 2 to do this.)

4. (*a*) State clearly the rule for the multiplication of ·7 by ·7, and give the result. Thence deduce the result of multiplying ·7 by ·007.

(*b*) Find the exact number of centimes nearest to ⅝ of a franc, and the exact number nearest but one.

5. If a yard of gold wire is worth 9s., what is the exact value in shillings, pence, and decimal of a penny, of 39·37 inches (a metre) of the same wire ?

If a dealer sold 1,000 lengths of this wire of 39·37 inches each, at 9s. 10d. per length, how much less than the true value would he receive ?

7. Elementary Science.

(Half-hour. One hundred marks. Answer *two* questions.)

1. A spectrum is thrown upon a white sheet in a dark room, and a stick of red sealing-wax moved slowly from the violet to the red end, what change in the colour of the wax takes place ?

2. A light is held close to one side of a mirror, and the eye is also placed close to the opposite side of the surface. Describe and explain what is seen.

3. A beam of light falls obliquely upon the surface of water. Draw a diagram to show the course of the reflected ray. What can you say about the brightness of the reflected ray (*a*) when the beam of light falls nearly perpendicular upon the surface ; (*b*) when it falls very obliquely ?

4. Distinguish between heat and temperature. Explain the means by which each is measured.

5. A jug of hot water is placed on a table in a room. Explain how it loses its heat.

8. Music.

(Quarter of an hour. Fifteen marks. Answer *three* questions.)

1. Rewrite the following, making a change to the first flat key at (*a*), and a return to the original at (*b*).

	(*a*)	(*b*)
Key C.	**d s m s ta l s f ta l**	**d' t r' d'.**

2. Write the following intervals :—

Major third above **ray♯.**
Diminished fifth above **me.**
Perfect fifth above **te,.**
Minor third above **fe.**
Major third above **ta.**

3. Rewrite the following in two-pulse measure, halving the value of each note and rest :—

| s :-\|m:d \| m:.r \| d :- \| f :s.f \| m:s \| r :-\|-:-\|-\| s :-\| f.m:r \| d :-\|-:- ‖

THE HORNIMAN MUSEUM AND LIBRARY.

We have been asked by the clerk of the London County Council to give a few particulars of the above museum and library, and we do so from a conviction that teachers will pick up many useful hints and suggestions by visiting them.

The museum and library are open free to the public daily throughout the year from 2 p.m. to 9 p.m., and on Bank Holidays from 10 a.m. to 9 p.m., except on Christmas Day, when they are closed. The Horniman Gardens, which adjoin the museum, are also open daily throughout the year.

The museum is four minutes' walk from Lordship Lane Station (S.E. and C. Railways), and six minutes from Forest Hill Station (L.B. & S.C. Railway).

The museum is under the supervision of a resident curator, who is ever ready to supply particulars to those who ask for them, and is anxious to make the museum as useful educationally as it is possible.

The special feature of the museum is the splendid collection of anthropological exhibits. By means of these the visitor is able to trace the gradual development of civilisation from the old stone age through the different periods up to the present time; and not only is our own country illustrated, but the founder of the museum, Mr. Horniman, was a great traveller, and brought home curiosities from all parts, which illustrate not only the rude manners and customs of barbarous people, but the mode of life among nations whose civilisation differs from our own. There are beautiful specimens of ivory-carving and wood-carving, and a rare collection of musical instruments.

In a side gallery are living specimens, not of rare zoological types, but of creatures familiar to all inhabitants of this country—toads, spiders, a colony of ants, etc.—and those who wish to go in for nature study in almost the only way possible in the heart of a large city may learn how to keep living specimens for study.

In the natural history section such interesting matters as protective coloration are well illustrated, and one case shows that shading is really more important than colour ; for the case is lined with sand, and contains two plaster ducks, one covered with sand, the other painted gray, but dark above and light below. This arrangement makes the latter practically invisible at a few yards' distance, while the sandy one is plainly seen.

OUR CERTIFICATE COURSE FOR 1904.

BY GEORGE COLLAR, B.A., B.SC.,

Head-master of the Stockwell Pupil Teachers' School.

TEST QUESTIONS ON LAST MONTH'S WORK.

Theory of Teaching.

1. In what way can the teaching of history and the teaching of geography be made to help each other?

2. Describe a good method of teaching either (*a*) the elements of home geography to very young children, or (*b*) latitude and longitude to an advanced class.

3. On what grounds does Froebel advocate nature study, and on what plan does he recommend its pursuit?

English Language and Literature.

1. Contrast *L'Allegro* with *Il Penseroso*. On what grounds would you regard either of them as belonging to lyric poetry?

2. What do you know of Milton's work as a writer of sonnets?

3. Who were the "Cavalier Poets"? Comment on any of their lyrics that strike you as particularly beautiful.

History.

1. Write an account of the Duke of Marlborough up to the end of the War of the Spanish Succession.

2. Indicate briefly the chief causes of the English Revolution and its chief immediate results. Discuss the grounds of its unpopularity in the reign of William the Third, and the causes of its permanence.

3. Who were the chief leaders of English political parties in Queen Anne's reign? Point to some distinctive features in the character of each of them.

4. Describe the proceedings which led to the legislative union of England and Scotland.

Geography.

1. Give a short description of that part of Africa which lies to the east of the Nile.

2. Which parts of Africa are under German and French influence respectively? Give a sketch of their trade.

3. Write a description of the Niger and Congo.

Arithmetic.

1. Six horses and eight cows cost me £375. I sell them for £446, 5s., making a profit of 25 per cent. on the horses and 10 per cent. on the cows. What was the average cost of each horse and of each cow?

2. A man buys a farm of 120 acres for £3,225; he repairs the buildings and lets it at 28s. per acre, thereby getting a return of 3½ per cent. on his money. How much did he spend on the repairs?

3. A dealer allows 12½ per cent. off his advertised prices, and still makes a profit of 25 per cent. on his outlay. What is the advertised price of an article on the sale of which he gains £3, 10s. 6d.?

Algebra.

1. Show that $a^{\frac{1}{a}} \times b^{\frac{1}{b}} = (ab)^{\frac{1}{a}}$, and determine the value of a^0.

2. Find the square root of

$$16x^6 - 24x^5 + 33x^4 - 50x^3 + 33x^2 - 24x + 16.$$

3. Prove that $\left(\frac{2a}{a-b} - 1\right)^2 + (1 - b^2)\left\{\left(\frac{2}{a-b}\right)^2 - 1\right\}$ is a square.

4. Solve the equations—

$$(1.)\ \frac{a}{x-a} + \frac{b}{x-b} = \frac{a+b}{x-a-b}.$$

$$(2.)\ \frac{1}{x^2-1} - \frac{1}{1-x} = \frac{7}{8} - \frac{1}{x+1}.$$

Geometry.

1. T is a point in the side QR of the equilateral triangle PQR. Prove that the squares on QT, TR are together less than the square on PT by the rectangle contained by QT . TR.

2. Prove that the angle in a segment of a circle is greater than, equal to, or less than a right angle according as the segment is less than, equal to, or greater than a semicircle.

Describe a right-angled triangle having given the length of one of the sides enclosing the right angle and the length of the line joining the right angle to the middle point of the hypotenuse.

Elementary Science.

1. Explain what you understand by an organ. Illustrate your explanation with reference to the liver, the kidney, and the eye.

2. What is the difference in composition between the air you inspire and the air you expire? What is the purpose of respiration, and how is it carried on in a frog, a fish, a snail, and a fly?

NOTES AND SYLLABUS FOR MARCH.

English Composition.

Prepare essays on the following subjects:—

1. Evening continuation schools.
2. Hobbies, such as stamp-collecting, pigeon-fancying.
3. Honesty in small matters.
4. Clouds.

Theory of Teaching.

Study Collar and Crook's *School Management*, Chapter xii. (first part, to the end of junior arithmetic). The benefits arising from the study of mathematics, especially arithmetic in our elementary schools, must be summarised, and the important points given under the head of "General Considerations in Teaching Arithmetic" carefully noted. There is hardly any subject that is more important to teach well; but unfortunately traditional methods are often unsound, and should in those cases give place to better ones. The papers on arithmetic which are now appearing in this magazine should be carefully studied, as they deal with the best modern methods of teaching the subject.

Finish the first volume of Froebel. The author groups together religion, nature, and language as the three most important branches of education; for he includes "mathematic, which is nature in man," under nature study. These three have one and the same end in view—namely, to connect the internal with the external, and to show them both in their natural, original, necessary accord and connection. These three subjects must be studied together, for "without a knowledge of the inner unity of these three, we lose ourselves in limitless multiplicity." Froebel then indulges in a certain amount of speculation with regard to the origin of language; but the accuracy of his views is extremely doubtful, and the importance of his conclusions—at any rate from the teacher's point of view—is of the very slightest. He goes on to say with great weight that "we ourselves, and yet more our children, would attain to a far deeper insight into language, if in learning languages we connected words, much more than we do, with real sight or touch of the things and objects signified. Language would then be to us not only a combination of sounds and words, but a real whole, made up of life and objects." He points out the intense delight that children take in rhythmic sounds and in rhymes, and exhorts us to avail ourselves of this tendency in our teaching. We are to guide this tendency along its own way, by selecting and improving nursery rhymes, not forbidding them; provided that a jingle is innocent, it should be tolerated.

Froebel's remarks are of great importance in connection with the teaching of composition. We often give as a test or exercise in composition a passage to be written out in "the child's own words." But here we are on the horns of a dilemma, because if the child is thoroughly familiar with the words used, and would naturally use them to express his thoughts, they are certainly "his own words," and it is useless and ridiculous to make him search for others. Hence we must not forbid the use of a word because it comes in the original. On the other hand, the child's mind is often just like the cylinder of a phonograph—it takes the impression of the words that are spoken into it, and when wound up reproduces those words. There is no vitality at all, or very little. This habit of reproducing words without allowing them first to produce ideas, which in their turn will produce the same or similar words when they have to be expressed, is not confined to young children. It occurs in older scholars and in adults, and we often hear a statement made which we believe to be the true expression of the speaker's thought, but yet the whole or a part of it does not signify what is in the speaker's mind. A student recently defined an indirect tax as "one that is paid by the consumer of the article in question—for example, the dog tax." Although objections might be raised with regard to the accuracy of the definition, it would naturally have been taken as a real expression of the student's thought if he had not added the illustration. The example, however, proved that he did not have in his mind the idea which is denoted by the word "consumer."

In teaching writing the child's "self-activity" must be called into play, for drawing or "picture-writing" is a means that comes naturally to children as a means of expressing and record-

ing their thoughts. Froebel holds that reading sprang from a wish to render audible to one's self or to others that which has been written down. By reading and writing man rises above every other known creature, and approaches the attainment of his destiny. Froebel then makes the difficult statement that "Man first becomes a *person* by the practice of this art." This is probably only an exaggeration to emphasise the importance of reading and writing, for it is not true whichever meaning we put on the word *person*. Man, of course, had an *individual existence* long before the invention of reading and writing. And if we take the original signification of *sounding through*, it is unquestionable that men carried messages that they had received orally long before they read out written communications. More true and important is the statement, "Writing connects men as present with the past and the future." The boy must realise the need for reading and writing before he is set to learn them.

The presentation of what is within man, the true self of man, is art. Art touches mathematics or the understanding in one direction, it touches language or reason in another, the representation of nature in another, and finally it coincides with religion in another. As a means of representing what is in man's mind it takes various forms: as presentment by pure sound, it is music, especially vocal music, or song; as presentment by colours for the sight, it is painting; as presentment in space, it is modelling and sculpture. The effort to draw appears at an early age in human development, and is followed a little later by efforts at modelling. Hence we conclude "that feeling for art is a general quality and gift of man, and it ought to be cherished from the first, at the latest in boyhood. The artistic feeling should be fostered even if the child has no special gift for art, and a proper training will enable a person to enjoy works of art, and save him from setting up as an artist without a true inner vocation."

There must be a union of instruction with life; home life and school life must be related as parts of one whole, not regarded as two separate things. We must be thankful for the great improvement that has taken place during the last twenty or thirty years in the relations between school and home. Parents of the lower classes are beginning to regard teachers as the friends of their children; but although a better feeling exists, many of these parents have not the opportunities or the knowledge necessary for full co-operation with the teacher. Children are not to be stamped like coins, all in the same mould, with an image and a superscription which are not their own; they must follow the laws of growth from within, and develop like trees. Froebel then gives a dozen "Means of Education":—

1. To awaken, nourish, and strengthen the religious sentiment which keeps the human heart in union with God.
2. To learn by heart religious sayings to be used in prayer, etc.
3. Care, knowledge, and exercise of the body, as the bearer and instrument of the mind.
4. Contemplation and observation of nature and of the outer world.
5. To learn by heart short poems representing nature and life, some of these to be sung.
6. Exercises in language as a means of expressing thought.
7. Exercises in representing forms of matter, modelling.
8. Drawing with the help of squared paper.
9. Lessons on colours, with their application to given surfaces.
10. Play, or kindergarten games.
11. Telling of stories, fables, and fairy tales adapted to the events of the day, the seasons, etc.
12. Short journeys and long walks.

In justification of No. 5 Froebel says that nature often speaks to boys, but in so low a tone that they cannot reproduce her teaching in words of their own, hence they want a poet's guidance; and in speaking of such means as the seventh, which require the pupil to produce, he says: "Man is developed and formed for the attainment of his true destiny, in part by what he as a boy receives from without and takes *into* himself, but incomparably more through what he unfolds and represents *out of* himself." In this way our method follows nature. The occupations have not a special measurable purpose—they are aimed at the development of the boy himself; and we may feel sure that each one having been truly trained to be a man has thereby been educated as well as is possible for every special duty, for each particular need, of civil and social life.

English Language and Literature.

Read carefully the third book of the *Golden Treasury;* mark and commit to memory any striking passages. This book deals with the poetry of the eighteenth century, in which there were fewer poetic giants than in the previous one—Shakespeare, Milton, Dryden had passed away, the last of the three dying May 1, 1700—but the general level of the poetic productions was certainly higher. A change, too, had come over the *form* of poetry, which must be referred to here, although it did not affect lyrical poetry much. Among the Elizabethan writers vast numbers of forms were in use in constructing the stanzas. Poets seemed to aim at new combinations by altering the number of syllables to the line and of lines to the stanza. The reform was brought about by Edmund Waller (1605–1687), the author of two poems in the second book, *Go, lovely Rose!* and *On a Girdle*. He set the fashion of regularity in poetry by reviving the ten syllable couplet which Chaucer had used with so much skill and success, but which had practically been out of use since about 1450. A similar change took place in France under the critical influence of Boileau, and this did much to strengthen the movement in England, so that, with the exception of lyric poetry and dramatic blank verse, there is a displeasing uniformity owing to the influence of these classical models. The works of Pope, who may be regarded as the greatest English poet of the century, are tedious if one attempts to read much at a time, because he was under the influence of this classical form. Consequently we have only one poem by this great writer in our collection—namely, cliv. After the death of Pope the classical influence became somewhat less rigid, and a strong tendency set in towards the study of nature. Young, the author of *Night Thoughts*, formed a sort of connecting link, but the leader of the "Nature" school was James Thomson, author of clviii., *Rule Britannia*, and clxxii. Students in or near London should visit Richmond Hill, where he used to take in the glorious view, and read the lines to his memory set up there.

William Collins was a friend and admirer of Thomson, and when the latter died Collins wrote an exquisite elegy, beginning,—

"In yonder grave a Druid lies."

The *Ode to Evening* and the *Ode written in 1746* are very popular, and show Collins's mastery over the delicate art of melody. *The Passions* affords a splendid exercise for recitation, owing to the close relation between the words and the ideas they express. At the early age of thirty-one Collins became a victim to fits of melancholy, and became hopelessly insane. After five years of mental suffering he passed away at Chichester, which was his birthplace.

The greatest lyric poet of the age was Thomas Gray, and in the preface to the *Golden Treasury* the compiler associates the period with the name of Gray. He did much to popularise the ode, which was a form of poem at that time much neglected in England. The chief writer of odes among the Greeks was Pindar, and Gray was a careful student and imitator of Pindar—*The Bard* is especially entitled a "Pindaric Ode"—and in recognition of the pre-eminence of Gray as a writer of odes, his monument in Westminster Abbey closes with the statement that Britain

"Felt a Homer's fire in Milton's strains,
A Pindar's rapture in the lyre of Gray."

There are in all eight odes by Gray in our collection, and all deserve very careful study. They should induce the student to read the rest of Gray's poems, which are not numerous. At first sight there seems to be a close resemblance between the works of Collins and those of Gray. Both adopted the same forms for their verses—those of the Greek odes; both were extremely fond of allegory and personification. But there is a greater freedom in the poetry of Collins and a greater finish in that of Gray. Collins seems as though he wrote spontaneously, and poured forth "his unpremeditated lay" without hesitation. Gray, on the other hand, had an extremely delicate ear and a keen sense of fitness, which made him spend a vast amount of pains over his writings before he could satisfy himself. He is said to have spent seven years over the *Elegy*. The result is that his verse is faultless and his expressions the best that can possibly be found for the ideas he wishes to convey, and it is absurd to attempt to paraphrase his work, as the effort can only result in the substitution of inferior and trivial phrases for the choice and clear-cut ones of the original. Gray's position among English poets is certainly a very high one, and would be higher had he written more. The *Elegy* is the finest poem in the school of Thomson, and the odes show that he refused to follow the rules for rhyming couplets which bound his contemporaries, and preferred the freer models of the Greek verse, of which he possessed a very deep knowledge. Shelley, as a writer of odes, is no doubt very deeply indebted to Gray. In his temperament and disposition he had a strong yearning for solitude, which is reflected in his poems, as is also a certain pessimistic spirit, particularly in the *Ode on a Distant View of Eton College*.

After the death of Gray there came a dearth of poetic genius over the south of our island; but in the north we have Burns with his poems so full of deep feeling, and Lady Lindsay has

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left us the immortal *Auld Robin Gray*. We cannot touch on the other writers, but may just say that in most cases their work was of an inferior class, and only served to set up the one or two gems that will always keep their names green. Thus Rogers's name will always be associated with *Mine be a Cot beside the Hill*, and Colley Cibber will be remembered as the writer of *The Blind Boy* long after his attempts to meddle with Shakespeare and the fact that he was Poet-Laureate are forgotten.

English History.

Study the period from 1714 to 1783. This takes us from the death of Anne to the close of the American War of Independence. One feature to be remembered in this period was the gradual establishment and maintenance of the naval power of Great Britain. In 1690 Lord Torrington, commanding a combined Dutch and English fleet, had been defeated off Beachy Head; but in 1692 Admiral Russell utterly defeated the French fleet at La Hogue. Louis the Fourteenth, finding that he could not afford men and money for his fleet if he was to maintain his army in a high state of efficiency, neglected his navy for the sake of the army; and as the Dutch were carrying on an exhausting war on land against the French, they were obliged to let their navy go. Thus it came about that at the end of the reign of Anne, England was far superior to either Holland or France as a naval power.

Another point to notice is the continued increase of the power of Parliament. Although theoretically the king is perfectly at liberty to accept or reject a Bill that has passed the two Houses of Parliament, yet the prerogative of rejecting a Bill was last exercised in 1707 by Queen Anne.

The mania for speculation, commonly known as the South Sea Bubble, must be studied on account of its great political effects, and the opportunity it afforded to Walpole of showing his great financial skill. In a book recently published by the Oxford Press many curious instances of speculation are given. Among the share certificates are the following:—

> "The Bearer hereof is entitled to 1,000 pounds in Copartnership for improving the Clothing Trades and making of Felt Hats in Great Britain; and for making, glazing, and leading Pantiles; on payment of one pound or more, as the Managers and Directors shall appoint; for which a proper receipt shall be given by an Eminent Banker, and the Money return'd on Demand."
>
> "This certifies that Lord Clifford is entitled to five thousand pounds stock in the National Fishery of Great Britain and Ireland, being part of ten millions intended to be subscribed at Sadlers Hall for carrying on the same."

The life of Walpole is very important, as he was by far the most influential person in the kingdom during the reigns of George the First and George the Second. We have referred to his skill as a financier, and in the case in which he was defeated—namely, over the Excise Bill—he showed that his views of financial questions were much sounder than those of the men before whom he gave way. In face of the great excitement over the fiscal question at the present day, it is advisable to look into his plans in detail; for although the Excise Bill was withdrawn at the time, the methods that Walpole advocated are those that are now in use. The chief point had reference to the system of "bonded warehouses." These are warehouses in which goods that are liable to duty may be stored from the time they are made or imported until the time they are required for consumption. Some goods, such as wines and spirits, are kept for a long time before use, because they improve by keeping. Let us suppose a cask of spirits kept for twenty years; then, if the duty were paid at the beginning of that time, since the interest on money for that period would amount to about as much as the principal, the owner would have to charge as much as if he paid the Government twice the duty at the end of the time. Hence the consumer would have to pay very much more for the goods than he would if the duty were payable at the end of the time, and no one is a bit the better. For when the system is well established the Government draws the same annual revenue whether the duty is payable at the beginning or end of the time. The plan also makes it easier to prove whether duty has been paid or not, and hence smuggling has been made much more difficult. This is an advantage to honest dealers, as they cannot be undersold by dealers in smuggled goods. Thirdly, if goods which have paid duty are to be re-exported, the duty is refunded (as a "drawback"), and this causes a great deal of unnecessary trouble and inconvenience; and probably it is largely to the existence of our bonded system that Great Britain is to such a large extent the entrepôt of goods for all parts of the world. The great advantage arising from this position in the world's commerce does not seem to be sufficiently considered by those who would interfere with our fiscal system. The bonded warehouse system is applied to whisky and other goods produced inland just as much as to brandy, tea, and other goods imported from abroad; but the duty on home-made goods is called excise, while that on imported goods is called customs duty. Perhaps, if Walpole had retained the name customs, he would have passed his measure.

Study the colonisation of North America, particularly as leading up to the division between England and France at the outbreak of the Seven Years' War. See the importance in this struggle of the naval power of England, which, however, was allowed to become weak in the Mediterranean, with the result that the French captured Minorca in spite of the attempt of Admiral Byng to relieve it. The sea power of England at the end of the reign of George the Second was a very important factor in the successes we gained in North America, including the conquest of Canada. The skill and daring of our admirals—Rodney, Boscawen, and Hawke—led to the destruction of the French fleet and deliverance of England from fear of invasion. The temporary loss of maritime supremacy in 1779 and 1780 is largely accountable for the success of the Americans.

The struggle for American independence requires to be carefully mastered, but it needs no special comment here, as it is fully set out in the text-book.

Geography.

Prepare the physical geography of North and South America, and complete the geography of British North America.

Arithmetic.

Study the two chapters on stocks. The difficulty that students have in dealing with questions on stocks arises not so much from the calculations as from the technical terms employed. These are fully explained in the text-book, and the student, after reading them, should consult the part of the daily paper which gives an account of the "Stock Exchange and City News," or the "Money Market." These columns should then be quite clear, and much interest will be found. The methods of dealing with calculations involving more than one kind of stock should be carefully studied in the model exercises.

Algebra.

Work miscellaneous examples involving questions in quadratics and proportion. Send up any difficulties.

Euclid.

Read the definitions in the fifth book of Euclid, and then take the definitions and first four propositions in the sixth. Work deductions on the third and fourth books.

Elementary Science.

Prepare a comprehensive and comparative account of circulation in different animals. Need of circulation; its twofold nature—to aerate the blood and hence the tissues, and to convey nourishment to the tissues. Compare the circulatory systems in the earthworm, snail, fresh-water mussel, fish, frog, and rabbit. Notice particularly how the one ventricle of the frog sends blood to the lungs and skin for aeration, and aerated blood (which enters last and leaves first) to the muscles and other organs.

Sea-urchins and starfishes have a vascular system—that is to say, there are tubes running to all parts of the body from a main trunk near the alimentary canal; but as these all end blindly, we cannot speak of this as a *circulatory* system, although it answers the same purpose. The large vessels in caterpillars and worms are contractile, but there is no heart. In the crab and lobster there is a strong muscular sac for propelling the blood into the arteries, whence it escapes into the general body cavity. In such molluscs as the snail and oyster the heart consists of two parts, an auricle and a ventricle. The cuttlefish has two auricles and a ventricle, as well as two organs which accelerate the passage of the blood through the gills.

In the case of vertebrates the blood is kept in special vessels all through its course, and does not find its way into the body cavity, as is the case with invertebrates. It also has red corpuscles. The heart of the frog and other amphibians has three cavities—two auricles and one ventricle. The venous blood from the body enters the right auricle, and the arterial blood from the lungs enters the left. These, however, do not contract quite simultaneously, the right contracting a little before the left. Hence the most impure blood goes to the bottom of the ventricle, and the arterial blood comes to the top. When the ventricle contracts, the first or purest part of the blood is sent to the brain, the next to the trunk and limbs, and the last, or venous blood, goes to the skin and lungs, where it is aerated.

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PHYSIOGRAPHY.

(STAGES 2 AND 3.)

MINERALS OF THE IGNEOUS ROCKS.

BEFORE attempting a classification of the igneous rocks, we will study some of the chief minerals of which they are composed, noting their chemical composition and the chief characteristics by which they may be identified. It will be seen that silica forms a large percentage of the constituents of these minerals.

SILICA MINERALS.

Quartz (composition SiO_2).—Quartz belongs to the hexagonal system, and the angles of the crystals are always constant. It is generally colourless and clear, and possesses a vitreous lustre. Its hardness is 7, so that a knife will not scratch it; specific gravity, 2·65. It exhibits no cleavage, but breaks with a conchoidal fracture, in the same way as glass. It seldom occurs in well-formed crystals, but is more often found as aggregates of granules. As it is very stable, it forms no decomposition products, and hence, in thin sections under the microscope, it generally appears quite clear. Its index of refraction is 1·547—almost exactly the same as that of Canada balsam. Since microscopic rock sections are almost invariably mounted in balsam, quartz does not show the scratchings and pittings produced on its surface. (In the case of a highly refractive substance like olivine these pittings are very noticeable.)

Enclosures are of frequent occurrence. These may consist of apatite, tourmaline, glass, or stone, and very frequently liquid and gas inclusions in small cavities, having the appearance of bubbles. These bubbles, when crowded together and very small, have the appearance of decomposition products, and sometimes cause quartz to be mistaken for felspar.

Opal, *Chalcedony*, and *Tridymite* are other minerals composed of silica, but are not important as rock-forming minerals.

SILICATES.

The silicates form a large and important group of minerals, forming the greater bulk of the igneous rocks. They are usually divided into two sub-groups—(1) *the alumino-alkaline silicates*, containing a considerable proportion of sodium and potassium silicates in chemical combination with aluminium and calcium silicates; and (2) *the ferro-magnesium silicates*, in which aluminium silicate is replaced wholly or partially by silicates of iron and chromium, and the silicates of sodium and potassium by magnesium silicate.

The alumino-alkaline silicates comprise the felspars, the felspathoids, and the micas.

The Felspars are composed chiefly of aluminium silicate, with varying proportions of sodium, potassium, and calcium silicates, the various varieties depending for their distinctive physical properties upon the proportions in which these silicates are present. In colour they vary from white to gray pink and red, but occasionally green felspars are found. The two main types of felspar are orthoclase and plagioclase.

Orthoclase is so named from the fact that it cleaves readily in two directions, approximately at right angles to each other. (Gr. *orthos*, straight; and *clao*, I cleave.) It belongs to the monoclinic system. Orthoclase is a potash felspar of composition $K_2O, Al_2O_3, (SiO_2)_6$.

In bulk it is usually opaque, gray, or red. A very clear and colourless variety with a vitreous lustre, found in lavas, is known as *sanidine*. Simple twinning is frequent, twins of the Carlsbad type being common. On broken surfaces the simple twinning is often shown by the cleavages in one part sloping towards the eye, and in the duller half sloping away from it. In microscopic slides prismatic sections, rectangular to hexagonal, are often shown. Unlike quartz, it seldom shows a granular structure. Cleavage is well marked, and is frequently in directions approximately at right angles, and decomposition products (kaolin) are generally present along the cracks. The refractive index, 1·523, is very near that of quartz. In very thin sections in polarised light a gray colour is predominant, but in thick sections the colours are much brighter, although not so brilliant as those shown by quartz. Zoning is common in some varieties, and is shown by the varying degrees of decomposition.

Apatite and iron oxide, as well as stone and glass, are sometimes present as inclusions.

The *plagioclases* comprise many varieties of felspar which have many characteristics in common. Perhaps the two most important types are anorthite, $CaO, Al_2O_3, (SiO_2)_2$, and albite, $Na_2O, Al_2O_3, (SiO_2)_6$. In chemical composition many of the other varieties may be regarded as compounds of anorthite and albite in various proportions.

Oligoclase varies in composition from six to three of albite combined with one of anorthite; *labradorite*, one of albite with one to three of anorthite. It requires great care, however, to distinguish the varieties without the aid of chemical analysis.

Plagioclase belongs to the triclinic system, but the crystalline forms are very similar to those of orthoclase. It is usually colourless and glassy to opaque white, and is very seldom red. The specific gravity varies from 2·62 in the case of albite to 2·76 in the case of anorthite; hardness, 6.

In hand specimens twinning is usually shown by bands of varying brightness parallel to the longer edges of the prisms. Under the microscope the sections are usually seen to be rectangular. The crystals, however, are often included in a glassy matrix, which frequently has corroded the crystals to a great extent. Dark decomposition products are generally present, especially when the cleavage shows. In the case of plagioclase (Gr. *plagios*, oblique) the cleavage is not at right angles. Zoning is common, and is very well shown in polarised light, as the different zones often show different colours. Twinning is also very common. This, however, is seldom simple, as in the case of orthoclase, but is of the type known as lamellar twinning, causing the crystals in polarised light to appear as if built up of strips of coloured glass. Microcline $(K_2, Na_2)O, Al_2O_3(SiO_2)_6$ shows a distinctive feature, in that it shows simple twinning, and the crystals under-crossed Nicol's prisms show a beautiful and delicate cross-hatching.

The Felspathoids are very similar in composition to the felspars, consisting mainly of silicates of alumina with silicates of the alkalies and of lime. They, however, sometimes also contain sulphur and chlorine. They replace the felspar to some extent in some igneous rocks. They differ from the felspars in crystalline form, crystallising in the cubic, tetragonal, and hexagonal systems. The chief felspathoids are *leucite*, *nepheline* (*elaeolite*), *noscan*, and *hauyn*.

Leucite $(K_2Na_2)O, Al_2O_3(SiO_2)_4$ belongs to the cubic system, and generally occurs in small white spheroidal crystals. It is found chiefly in lavas. Under the microscope octagonal or almost rounded crystals are shown.

The inclusions (glass-enclosures, green augite, etc.) are generally grouped either in zones or radially, and this is especially so in the case of the smaller crystals.

The refractive index, 1·508, is below that of the felspars. The larger examples sometimes show twin lamellæ, which in polarised light are often brilliantly coloured.

Nepheline $(Na_2K_2)O, Al_2O_3(SiO_2)_2$ is the only felspathoid found in the British Islands, where it is found in the Scilly Islands. It occurs plentifully, however, on the Continent. In the massive form (known as elaeolite) it has a greenish, greasy-looking surface, and can be just scratched by a knife (hardness, 5·5). It

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easily decomposes, and the decomposition products comprise natrolite and other zeolites, forming pale yellowish fibrous fringes round the margin.

It crystallises in hexagonal prisms, and hence the typical sections are rectangles or squares and hexagons. Elaeolite often shows a granular structure.

Polarised light shows low polarisation colours, except in hexagonal sections, which are isotropic unless oblique.

Nepheline is distinguished from felspar by the absence of twinning, by its less brilliant polarisation colours, and the great amount of decomposition which it has usually undergone.

Nosean $(Na_2O)_2(Al_2O_3)_3(SiO_2)_6 + 2Na_2SO_4$, and *hauyn* $([Na_2Ca]O)_3(Al_2O_3)_3(SiO_2)_6 + ([Na_2Ca]SO_4)_2$, both belong to the cubic system. In microscopic sections they appear colourless to blue or greenish. Sections are square or hexagonal. In nosean, zoning is marked by the enclosures grouped near the margin, while in hauyn the enclosures generally occur near the centre. Both nosean and hauyn are isotropic, and neither of them shows twinning or cleavage; hence they are rather difficult to distinguish.

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Spectra of Potassium, Rubidium, and Caesium.—The spectra of these alkali metals, obtained by volatilising them in the oxyhydrogen flame, have been examined by Hugh Ramage, and the results recorded in the *Proceedings of the Royal Society*. It has been found possible to sort the lines into three series—a principal series, and a second and third subordinate series. If diagrams are constructed with vibration frequencies (vibration frequency = velocity of light ÷ wave length) as *abscissæ*, and either (1) atomic masses or (2) the squares of the atomic masses as ordinates, it is shown that a close connection exists between the spectra and the atomic masses. Ramage gives empirical formulæ by means of which the subordinate series can be calculated fairly accurately. The limits also to which the series converge have also been calculated. The results show that in the corresponding series the differences depend solely on the atomic masses of the elements.

Estimation of Nitrogen.—The method adopted by the Association of German Agricultural Experiment Stations consists in heating the substance for three hours with sulphuric acid containing 200 grams of phosphoric oxide per litre, and about one gram of mercury. In the Gunning-Atterberg modification of Kjeldahl's method, about one to two grams of the substance is heated for a quarter of an hour with 20 c.c. of sulphuric acid and about one gram of mercury. Fifteen to twenty grams of potassium sulphate are then added, and the mixture boiled for a quarter of an hour after it has become colourless. In the case of substances which do not froth, the potassium sulphate may be added at the commencement.

The results of a large number of determinations made at Bonn, Danzig, and Hohenheim have shown that the two methods are equally trustworthy, the difference in both cases being less than 0·1 per cent. of nitrogen in 95 per cent. of the analyses.

Both potassium sulphate and phosphoric oxide quicken the decomposition, but potassium sulphate has the advantage that it does not attack the glass.

Detection of Iodine and Bromine in Presence of Thiosulphates.—In a solution containing iodide or bromide along with a thiosulphate, it is best to remove the thiosulphate before testing for the iodide or bromide. A convenient method of doing this is to add to the boiling solution a slight excess of lead nitrate, which in a few minutes precipitates the thiosulphate. The greater portion of the iodine is also precipitated, but sufficient is always left in solution to detect by means of the ordinary tests applied to the filtrate. Bromine can also be detected in the filtrate in the ordinary way, but is best detected by adding to the solution a little sodium hydroxide and a little fluorescein, which gives an intensely red coloration.

Deviable Rays.—The discovery of radium has caused increased interest to be taken in radio-activity, and many investigators are working enthusiastically on the subject. It is interesting to recall that in 1902 E. Rutherford and A. G. Grier published a paper in the *Philosophical Magazine*, in which they showed that uranium, thorium, and radium emit rays, some of which could be deflected and others could not. They state that the proportion of deviable rays given out by uranium is greatest.

Preparation of Periodates.—Periodates of the alkalies can be readily prepared by acting on an iodide in alkaline solution with an excess of a hypochlorite. If 50 grams of potassium iodide and 20 grams of sodium hydroxide are dissolved in water, and a large excess of sodium hypochlorite is added, and the mixture then heated on the water bath, a precipitate of crystalline sodium periodate is gradually formed.

Rapid Electrolysis of Metallic Salts.—It is now well known that in electrolysing a solution of a metallic salt the process is very much hastened if the anode is caused to rotate. This can easily be applied to analytical operations in the following way:—A platinum dish is used as cathode, and for anode a spiral of thick platinum wire is used, and this is bent so as to follow approximately the curvature of the dish. The anode should be mounted, so that it can be caused to rotate by a water motor or other suitable agency, and should make from 500 to 600 revolutions per minute. The volume of the solution should not be more than about 125 c.c., and should, as a rule, be heated to near boiling to start with, but need not be heated further during the electrolysis. In the case of an acid solution, which is liable to attack the deposited metal when the current is stopped, the acid solution should be siphoned off and distilled water added at the same time, so that the deposited metal is covered by liquid until the acid is removed. The current should be kept flowing until this has been accomplished.

Electrolytic Separation of Manganese and Iron (J. Köster, Berlin, 1903, p. 36).—Manganese can be separated from iron electrolytically in the following way:—The double ammonium oxalates of iron and manganese are electrolysed with a current of 1·5 to 2 ampères and 3 to 4 volts in a cold solution. The time required is about five to eight hours. As soon as the manganese dioxide begins to appear at the anode a little phosphorous acid solution is added, and this is repeated during the first two hours of the process.

The Acetate Method of Separating Iron and Manganese.—Considerable difficulty is often experienced in carrying out this process satisfactorily; but if the following details are strictly followed, there should be no difficulty. Suppose the object of the analysis is to estimate the iron and manganese in ferro-manganese. First grind to very fine powder, and then weigh out about 0·2 grams. Dissolve in hydrochloric and nitric acids, and evaporate solution in a dish to dryness. Moisten with hydrochloric acid, add water, and dissolve as much as will dissolve. Filter off the residue. Now dilute the solution to about 500 c.c. in a comparatively large flask (about 32 oz.). Nearly neutralise with solid sodium carbonate, keeping the solution clear. The final step may be made with a solution of ammonium carbonate, which should be added until the precipitate first formed only just redissolves on stirring. When the desired point is reached the solution will appear opalescent. For a successful precipitation of the iron, the solution of acetic acid and alkali acetate used in the next step should be prepared so that the acid and salt are present in approximately molecular proportions. If ammonium acetate is used, it must be remembered in making the solution that commercial ammonium acetate is generally strongly acid, and this must be allowed for.

Next raise the neutralised solution nearly to boiling, and add the acetic acid and sodium or ammonium acetate mixture in slight excess. Boil for a short time only (about one minute should be sufficient), and the iron will be precipitated in a suitable form for filtering. Let the precipitate subside, and then decant the liquid through a filter. Wash the precipitate several times by decantation with hot water, and then transfer to the filter and wash thoroughly with hot water. The iron precipitate is then dissolved in hot dilute hydrochloric acid, and estimated in the usual way by nearly neutralising the solution, heating nearly to boiling, and precipitating with hot dilute ammonia solution, filtering, washing, drying, and igniting to ferric oxide.

The filtrate from the first precipitation of the iron contains the manganese, and is treated in the following way:—

Evaporate in a dish to a small bulk (about 100 c.c.). Add bromine water until permanently yellow from excess of bromine. Add excess of ammonium hydrate, and warm. The manganese is precipitated as hydrated peroxide. This should be filtered off, and the filtrate again treated with bromine water and ammonia, to make sure that all the manganese has been precipitated. The precipitate is then washed, dried, strongly ignited, and weighed as Mn_3O_4.

Separation of Zinc and Cobalt.—Zinc sulphide can be quantitatively separated from cobalt if the zinc sulphide is precipitated from an acetic acid solution, as it is then found that very little cobalt indeed is carried down by the zinc sulphide. The separation is best carried out from a solution to which cyanide of potassium has been added so as to form potassium cobalticyanide. It is found that if cobalt peroxide is precipitated from an alkaline solution by the use of potassium persulphate, a quantity of zinc hydrate is present in the precipitate, and therefore the separation cannot be carried out in this way.

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Work done by a Force.—Some typical problems dealing with the work done by a force have been already referred to in these "Notes," but the subject is so important, and has so many and varied applications, that it is difficult, if not impossible, to indicate the amount of time and attention that should be given by the student in order that he may become familiar with at least a few of the many problems which are continually presented in this section of the subject in the various examination papers.

In the so-called simple machines it is frequently only necessary to compare the velocity of the effort (or force) to the velocity with which the weight is raised, or the resistance overcome. Thus if r denote the velocity ratio, E the effort, and R the resistance or load, then neglecting friction $Er = R$ . . . (1) This gives what is called the hypothetical or theoretical advantage, but it by no means follows that the actual relation between E and R is obtainable from (1). Friction cannot always be neglected, and this is essentially the case in all practical problems, in which the work lost in friction and resistances may amount to 60 per cent. or more of the total work put into the machine. In such cases the relation between E and R may be found by the *principle of work*—that is, the work done by E is equal to the work done by R (in the same time), or $ES_1 = RS_2$, where S_1 and S_2 denote the distances moved through by E and R respectively.

Ex. 1. Investigate the mechanical advantage of a smooth screw. Find the ratio of the effort to the weight in a screw which has ten threads per inch of length, and is moved by an effort acting perpendicularly to an arm one foot long. (1902.)

Here the distance moved through by E in one turn will be $2\pi \times 12$.

$\therefore$ work done by $E = E \times 2\pi \times 12$.

As there are ten threads per inch, the weight will be raised through a distance equal to $\frac{1}{10}$ of an inch for one rotation of the lever. Hence we obtain the relation

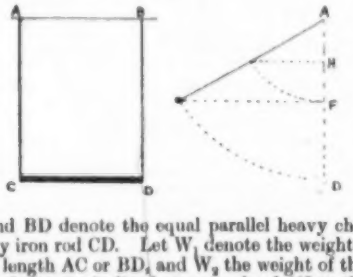
$$24\pi \times E = W \times \tfrac{1}{10},$$

$$\text{or } \frac{E}{W} = 240\pi.$$

The work done in raising a weight of W lbs. through a distance S is the product WS. In a similar manner the work done in raising a number of heavy bodies may be obtained either by multiplying the weight of each by the distance through which its centre of gravity is raised and finally adding together all the results so obtained, or we may proceed to find the common centre of gravity of the bodies, and multiply the distance through which the centre of gravity moves by the sum of the weights.

Ex. 2. Prove that the whole work in raising a system of heavy bodies through different heights is the same as that of raising the sum of the weights through a height equal to that through which their centre of gravity is raised.

A trapeze consists of a heavy iron rod suspended by equal parallel heavy chains; find the work done in inclining the chains to an angle of 60° to the vertical. (1903.)



Let AC and BD denote the equal parallel heavy chains carrying the heavy iron rod CD. Let W_1 denote the weight of the two chains, l the length AC or BD, and W_2 the weight of the iron rod.

When the chains are inclined at an angle of 60° to the vertical, the centre of gravity of the rod has been raised through a distance DF; and as $AF = l \cos 60° = \frac{1}{2}l$, $\therefore$ $DF = \frac{1}{2}l$.

Hence work done $= W_2 \times \frac{l}{2}$.

The centre of gravity of each chain is at a distance $\frac{l}{2}$ from AB.

The centre of gravity is raised from F to H, and as

$$AH = \frac{l}{2} \cos 60° = \frac{l}{4},$$

$$\therefore \text{ work done} = W_1 \times \frac{l}{4}.$$

Hence total work $= W_1 \times \frac{l}{4} + W_2 \times \frac{l}{2}$.

As a special case let $W_1 = W_2 = W$.

Then work done $= \frac{3Wl}{4}$.

Expansion of a Gas.—An interesting example of the work done by a *variable force* is furnished by a piston forced along a cylinder by a gas expanding in volume, *the temperature of the gas remaining constant*. The gas expands according to the law pv = constant, where p is the pressure in pounds per square inch or per square foot, and v is the volume in cubic feet. The law referred to is known as *Boyle's Law*, and the expansion as *Isothermal Expansion*—that is, if p_0 is the pressure of the gas when the volume is v_0, then the pressure when the volume is v_1 may be obtained from the relation $p_1v_1 = p_0v_0$.

The law may be written as $pv = c$. Then for any assumed value for c, for various values of v, corresponding values of p can be calculated and tabulated. If the values of p and v are plotted, the curve passing through the plotted points is known to be a *hyperbola*. The area of any portion of the curve represents the work done, and may be obtained by any of the well-known rules of mensuration. The work done during expansion may easily be found by using the elementary notions of the calculus. Thus if $pv = c$ be the law of the expansion, then the work done through a volume dv is pdv . . . . . (1), and the work done as the volume increases from v_1 to v_2 is given by integrating (1) between these limits. Obviously p may be expressed in terms of v from the relation $p = \frac{c}{v}$, and substituting this value (1) becomes $\frac{c}{v}dv$. The integral of this between the limits v_1 and v_2 is $p_1v_1 \log_e \frac{v_2}{v_1}$.

In a similar manner, if the gas expands according to the law $pv^s = c$, then the work done in its expansion from a volume v_1 to a volume v_2 is

$$\frac{p_1v_1}{s-1}\left\{1 - \left(\frac{v_1}{v_2}\right)^{s-1}\right\}. \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

It will be noticed that when $s = 1$ this assumes the form $pv = c$.

More detailed proofs of the formulæ (1) and (2) may be obtained from any text-book on the subject. The preceding will probably give all the requisite information.

Another formula frequently required may be stated as follows:—If a quantity of air, volume v_1, pressure p_1, is mixed with another quantity of air, volume v_2, pressure p_2, then when mixed, if v denotes the resulting volume, and p the pressure, assuming the temperature is constant, the relation is

$$pv = p_1v_1 + p_2v_2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

Ex. 3. What is meant by the elastic force of a gas?

A gas A has twice the volume and three times the elastic force of a gas B; if they be mixed without alteration of total volume, show that the resultant elastic force is $\frac{7}{8}$ that of A. (1902.)

Let p_1 v_1 denote the elastic force and volume of the gas A, and similarly p_2 v_2 the force and volume of the gas B, and let pv denote the resulting force and volume. Then we have the relation

$$pv = p_1v_1 + p_2v_2,$$

and substituting, this becomes

$$3pv_2 = 3p_2 \times 2v_2 + p_2v_2 = 7p_2v_2.$$

$$\therefore p = \tfrac{7}{3}p_2. \quad \text{But } p_2 = \tfrac{1}{3}p_1. \quad \text{Hence } p = \tfrac{7}{9}p_1.$$

Ex. 4. Calculate the work done when 1,000 cubic feet of gas expand to 1,050 cubic feet in an expansible envelope, the initial pressure being 2,000 lbs. per square foot.

$\log_{10} = 105 = 2{\cdot}021$; $\log_{10}e = 0{\cdot}434$. (1901.)

Here in the formula $p_1v_1 \log_e \frac{v_2}{v_1}$ we have $p_1 = 2{,}000$, $v_1 = 1{,}000$, $v_2 = 1{,}050$. Substituting, we find—

$$\text{Work done} = 2000 \times 1000 \log_e \frac{1050}{1000}$$

$$= 2{,}000 \times 1{,}000 \times \frac{\cdot 021}{\cdot 434} = 96780 \text{ ft. lbs.}$$

Ex. 5. If a gas expands according to the law pv^s = constant, show that the work done in its expansion from a volume v_1 to a volume v_2 is

$$\frac{p_1v_1}{s-1}\left\{1 - \left(\frac{v_1}{v_2}\right)^{s-1}\right\}.$$

What is the result when s has the value unity? (1902.)

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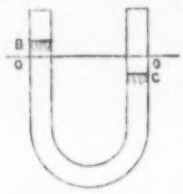
Bike.—Prove that the free oscillation of the mercury of a barometer in a U-tube of uniform bore will synchronise with a pendulum of half the length of the mercury column. (B.Sc. 1903.)



Suppose the line OO to denote the equilibrium position of the mercury, and assume that the fluid is displaced, say, by moving the tube quickly to one side and back again to its central position: this will cause the liquid to rise in one side of the tube and to fall in the other, followed by a corresponding rise on the opposite side as the liquid swings past its equilibrium position. The interval of time which elapses from the mercury being in its highest position on one side until it is again in its highest position on the same side and moving in the same direction, is the *periodic time of the vibration*. If we assume that the figure denotes an instantaneous photograph of the mercury when at the end of one swing, then it will be noticed that the liquid is always urged by a force which varies directly as the distance from, and which tends to make it return to, its equilibrium position. The liquid therefore swings backwards and forwards with a nearly pure, simple harmonic motion. For such motions we have the relation

$$\frac{\text{displacement}}{\text{acceleration}} = \text{a constant},$$

and the periodic time T is given by the formula

$$T = 2\pi\sqrt{\frac{\text{displacement}}{\text{acceleration}}}.$$

Let the displacement OB be denoted by x. Then if A denote the area of the cross-section of the tube, l the length of the column of mercury BC, and w the weight of unit volume, then the force acting at B will be $A \times 2xw$.

The mass of the liquid will be $\frac{Alw}{g}$.

$$\therefore a = \text{acceleration} = \frac{\text{force}}{\text{mass}} = \frac{A \times 2xw}{\frac{Alw}{g}} = \frac{2xg}{l}.$$

$$\text{Hence } \frac{\text{displacement}}{\text{acceleration}} = \frac{l}{2g}.$$

Thus the periodic time of a vibration is given by

$$T = 2\pi\sqrt{\frac{l}{2g}},$$

and this is obviously the same as that of a simple pendulum of one-half the length.

Carrett.—Two coils each of 10 ohms resistance can be combined either in "series" or in "parallel;" what is the resultant resistance in each case? (Camb. Junior, 1903.)

The solution in each case may be obtained by means of two simple theorems. These, which may be found in any text-book on electricity, are as follows:—

1. The equivalent or resultant resistance of wires joined in series is equal to the sum of their separate resistances.

2. The equivalent resistance r of wires joined in parallel is such that its reciprocal is equal to the sum of the individual resistances r_1, r_2, . . .

or that $$\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \ldots$$

1. Thus, when the two coils are combined in series, the resultant resistance = 10 + 10 = 20 ohms.

2. In the case of two coils in parallel let r denote the equivalent resistance, and r_1, r_2 the individual resistances, of the two coils respectively.

Then when the two coils are combined in parallel, the relation becomes

$$\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2}. \quad \therefore r = \frac{r_1 r_2}{r_1 + r_2}.$$

Substituting the given values, this becomes

$$r = \frac{100}{10 + 10} = 5.$$

Hence the resistance is 5 ohms.

Dolo.—When a small quantity of air, say a cubic centimetre, is enclosed at atmospheric pressure, it exerts upon each square centimetre of the interior of the containing vessel a pressure of a certain number of dynes. The pressure upon a square centimetre of the outside of the vessel is the *weight* of a column of air of certain dimension. These two facts seem to be implied by most books. Will you give any explanation why the pressure in the second case is not due to the kinetic energy of the molecules, as it seems necessarily to be in the first case? or why, if the outside pressure is due to *weight*, the infinitesimal amount inside the cubic centimetre can "weigh" as much as the atmospheric column outside?

It is by no means an easy matter to ascertain what your difficulty is. Perhaps the latter part of your question, "the infinitesimal amount inside the cubic centimetre can 'weigh' as much as the atmospheric column outside," is a clue to the whole matter. In dealing with problems relating to fluid pressure, the weight of the fluid usually has little or no connection with the matter. Imagine a small cubical box, each side of which is a centimetre; then the volume will be one cubic centimetre, the weight of the enclosed air will make the pressure on the base slightly greater than that on the top; but as the weight of the enclosed air is exceedingly small, the difference between the pressures on the top and bottom of the containing vessel is negligible. The pressure on both the inside and the outside surface is due to the kinetic energy of the molecules, but there is no such upper surface for the air outside as that suggested, and it is convenient to indicate that the pressure outside is due to a column of air the weight of which will give the necessary

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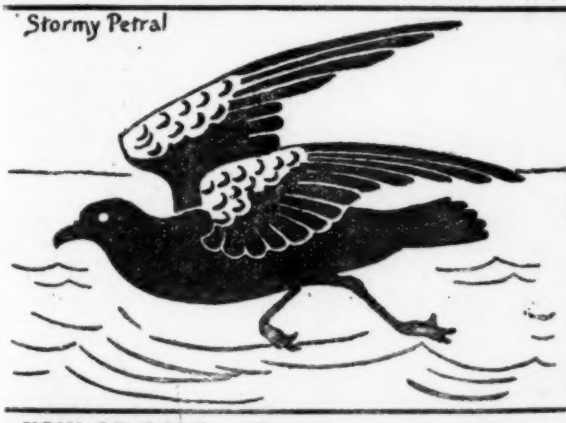

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pressure. The same remarks apply to fluids generally. Thus, the weight of water in a length of pipe leading to a water-tap may be comparatively small, but the pressure on the water may be due to a "head" or column of fluid of several hundred feet, as, for example, in the pipes of comparatively small bore used for hydraulic purposes, in which the pressure may be 700 to 1,500 lbs. per square inch.

Boot.—Eliminate x, y, z from the equations—

$$(x-y)(y-z)(z-x) = p^3 \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

$$(x+y)(y+z)(z+x) = q^3 \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

$$(x^2+y^2)(y^2+z^2)(z^2+x^2) = r^6 \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

$$(x^4+y^4)(y^4+z^4)(z^4+x^4) = s^{12} \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

Squaring (1) and (2), we have—

$$p^6 = (x^2-2xy+y^2)(y^2-2yz+z^2)(z^2-2zx+x^2) \quad . \quad (5)$$

$$q^6 = (x^2+2xy+y^2)(y^2+2yz+z^2)(z^2+2zx+x^2) \quad . \quad (6)$$

Then from (5), (6), and (3) we have—

$$\begin{aligned} p^6+q^6-2r^6 &= (x^2+y^2)(y^2+z^2)(z^2+x^2) \\ &\quad -2xy(y^2+z^2)(z^2+x^2) - 2yz(z^2+x^2)(x^2+y^2) \\ &\quad -2zx(x^2+y^2)(y^2+z^2) \\ &\quad +4xyz\{z(x^2+y^2)+x(y^2+z^2)+y(z^2+x^2)\} \\ &\quad -8x^2y^2z^2 + (x^2+y^2)(y^2+z^2)(z^2+x^2) \\ &\quad +2xy(y^2+z^2)(z^2+x^2) + 2yz(z^2+x^2)(x^2+y^2) \\ &\quad +2zx(x^2+y^2)(y^2+z^2) \\ &\quad +4xyz\{z(x^2+y^2)+x(y^2+z^2)+y(z^2+x^2)\} \\ &\quad +8x^2y^2z^2 - 2(x^2+y^2)(y^2+z^2)(z^2+x^2). \end{aligned}$$

$$\therefore p^6+q^6-2r^6$$

$$= 8xyz\{z(x^2+y^2)+x(y^2+z^2)+y(z^2+x^2)\} \quad . \quad . \quad . \quad (7)$$

But $q^3 = (x+y)(y+z)(z+x)$

$$= z(x^2+y^2)+x(y^2+z^2)+y(z^2+x^2)+2xyz.$$

Hence (7) may be written—

$$p^6+q^6-2r^6 = 8xyz(q^3-2xyz).$$

$$\therefore 16x^2y^2z^2 - 8q^3xyz + p^6+q^6-2r^6 = 0 \quad . \quad . \quad . \quad . \quad (8)$$

Again, from (5) and (6) we have—

$$p^6q^6 = \{(x^2+y^2)^2 - 4x^2y^2\}\{(y^2+z^2)^2 - 4y^2z^2\}\{(z^2+x^2)^2 - 4zx\}.$$

$$\therefore p^6q^6 = (x^4-2x^2y^2+y^4)(y^4-2y^2z^2+z^4)(z^4-2z^2x^2+x^4) \quad . \quad (9)$$

Also, on squaring (3), we have—

$$r^{12} = (x^4+2x^2y^2+y^4)(y^4+2y^2z^2+z^4)(z^4+2z^2x^2+x^4) \quad . \quad (10)$$

Then, in the same manner in which (8) was obtained from (5), (6), and (3), we may show that

$$16x^4y^4z^4 - 8r^6x^2y^2z^2 + p^6q^6 + r^{12} - 2s^{12} = 0 \quad . \quad . \quad (11)$$

Solving (8) for xyz, we have—

$$xyz = \frac{4q^3 \pm \sqrt{16q^6 - 16(p^6+q^6-2r^6)}}{16} = \tfrac{1}{4}(q^3 \pm \sqrt{2r^6-p^6}).$$

Similarly, solving (11) for $x^2y^2z^2$, we have—

$$x^2y^2z^2 = \tfrac{1}{4}(r^6 \pm \sqrt{2s^{12} - p^6q^6}).$$

Hence $4(r^6 \pm \sqrt{2s^{12}-p^6q^6}) = (q^3 \pm \sqrt{2r^6-p^6})^2$.

Puzzled.—What equal sums of money must be invested in 3 per cent. stock at 99¾, and 2½ per cent. stock at 88½, in order that the difference between the incomes obtained from the investments may be £44? (Brokerage ¼ per cent.)

For £100 stock in the 3 per cents. the investor pays £99¾, and for £100 stock in the 2½ per cents. he pays £88½ (in each case including brokerage).

Since £99¾ invested in the 3 per cents. yields £3 per annum, therefore £1 invested in the 3 per cents. yields $£\frac{3\times 4}{399}$; that is, £$1\frac{1}{133}$.

Again, £88½ invested in the 2½ per cents. yields £½ per annum; therefore £1 invested in the 2½ per cents. yields £$\frac{1}{2}\times\frac{2}{177}$, that is, £$\frac{1}{709}$.

$$\frac{4}{133} - \frac{20}{709} = \frac{2836-2660}{133\times 709} = \frac{176}{133\times 709}.$$

Hence, when the difference between the incomes amounts to £$\frac{176}{133\times 709}$, equal sums of £1 have been invested. Therefore, when the difference of incomes amounts to £1, equal sums of £$\frac{133\times 709}{176}$ have been invested. Therefore, when the difference of incomes is £44, equal sums of £$\frac{133\times 709}{176}\times 44$, or £23,574, 5s., have been invested.

J. H.—A dinner-party, consisting of ten persons, sit round a table, a lady and gentleman alternately, the host and hostess each occupying one end of the table, and their guests being arranged four on each side. Find the number of ways in which the table may be arranged.

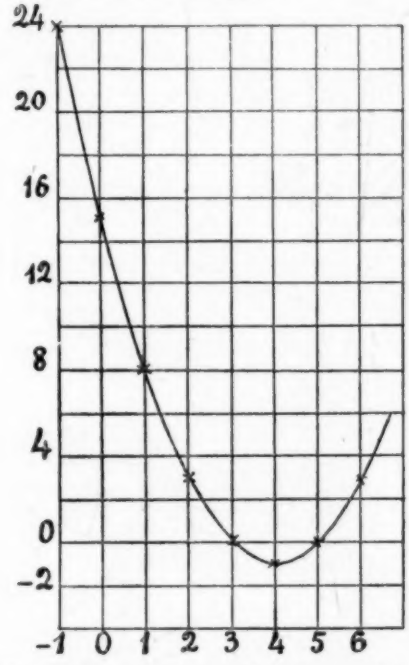
The first and third places from the hostess on each side of the table are occupied by the gentlemen. Hence these places can be filled in $\underline{|4}$ different ways. With each of these arrangements we have $\underline{|4}$ different arrangements of the lady guests. Hence the table may be arranged in $\underline{|4}\times\underline{|4}$ ways—that is, 24×24, or 576 ways.

Vivian.—Plot the graph $y = x^2 - 8x + 15$ between the values $x = -1$ and $x = 6$, obtaining the minimum value of y.
(Cambridge Junior, 1903.)

Calculating the values of y corresponding to a number of values of x between the given limits, we obtain the corresponding values of x and y exhibited in the following table:—

x	−1	0	1	2	3	4	5	6
y	24	15	8	3	0	−1	0	8

Plotting the values of x horizontally on the scale of one inch to unity (say), and the values of y vertically on half the above scale (suppose), we obtain a graph similar to that shown on a reduced scale in figure.



It is obvious that the lowest point of the graph is reached when $x = 4$, and we have already found that the corresponding value of y is -1. The minimum value of y is therefore -1.

Certificate.—If 40 per cent. of income-tax returns are so wrong that, if corrected, the tax would yield 52 per cent. more, how far wrong on the average must they be, the other returns being right?

Where £100 was received, £152 ought to have been received, and so, in regard to the incorrect returns by themselves, £40 was actually received instead of £92. Thus on the average there was an error of £52 on each £40 returned by those who did not make correct returns—that is, on each £100 in these incorrect returns they were wrong by £$\frac{100\times 52}{40}$, or 130 per cent.

Euclid.—Can you inform me if there is any method of trisecting any angle, and also proof for same?

See Casey's *Elements of Euclid*, Note F. Taylor's *Treatise on Conic Sections* may be consulted for further information on this subject.

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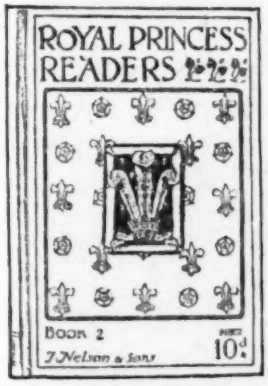

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